Royal Commission
on Canada's Economic Prospects

The Canadian Construction Industry

by The Royal Bank of Canada

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ROYAL COMMISSION ON CANADA'S ECONOMIC PROSPECTS

THE CANADIAN CONSTRUCTION INDUSTRY

OCTOBER, 1956

Prepared by

THE ROYAL BANK OF CANADA

While authorizing the publication of this study, which has been prepared at their request, the Commissioners do not necessarily accept responsibility for all the statements or opinions that may be found in it.

THE ROYAL BANK OF CANADA

Head Office
Montreal

October 10th, 1956

Walter L. Gordon, Chairman,
Royal Commission on Canada's Economic Prospects.

Dear Mr. Gordon:

I am pleased to submit this study of the Canadian construction industry which we undertook at your request for the Royal Commission on Canada's Economic Prospects. While the study was prepared by members of our head office staff with the assistance of personnel in our various branches and supervisory departments across the country, the views and opinions expressed herein do not necessarily represent in any way those of this bank or its executive.

Yours very truly,

J. MUIR,
Chairman and President

PREFACE

THE TERMS of reference for this study of the Canadian construction industry, as laid down by the Royal Commission on Canada's Economic Prospects, were to make an economic study and appraisal of all aspects of the construction industry, including probable trends and prospects for the next 25 years. Further, for purposes of this study, the construction industry was so defined as to include only independent contracting or operating units, that is, independent agents actually engaged in or performing some construction operation.

Working within these terms of reference meant excluding any detailed discussion of construction supply firms and of any other units not actually engaged in putting construction work into place. It also meant excluding from the discussion the operations of certain units (such as the construction departments of public utilities and government departments) doing construction work but not on an independent basis. The volume of work which the industry does, therefore, is less than total construction activity in the country, and this caused some difficulty because a good deal of the statistical material was available only on an activity basis and not an industry basis. In many instances, then, we have had to use activity instead of industry data to illustrate the argument. However, we do not believe that the use of activity figures where the industry ones are lacking destroys the argument because the two sets of data are closely enough related to enable the one to be substituted for the other where necessary. Indeed, for our forecasts we concentrated on the activity rather than the industry figures on the assumption that forecasts of total construction activity would be of more use and interest than an industry forecast.

In carrying out our terms of reference we have concentrated mainly on the supply side of the industry as opposed to the demand side, which usually receives its full share of attention in published material. Our main concern has been not so much with what, where, or for whom the industry produces (the demand side) but rather with how the industry produces and functions. This meant, however, that a considerable amount of field work and interviewing had to be done, for we discovered at an early stage in our investigations that the embarrassing wealth of statistical material on the subject was more than matched by an appalling lack of published material on the functioning, operating, and other qualitative aspects of the industry. To this gap in the literary material must be attributed the length of the list of organizations, noted in the acknowledgements, to whom we are so much indebted for information provided so kindly and liberally.

One interesting aspect of our field work involved sending a comprehensive questionnaire to various general contractors across the country. (A copy of the questionnaire is given in an appendix to this study.) Those general contractors were selected whom we could most easily arrange to have interviewed at their offices by our bank staff located in the various areas. This arbitrary method of selection, coupled with the necessarily qualitative and detailed nature of the replies, rendered unfeasible a statistical treatment of the replies. Instead, the replies were used for directing and organizing our work and in suggesting avenues for further research. Matters for further inquiry and investigation arising out of the replies were taken up with the associations or individuals most likely to be informed on the subject under consideration.

Most of the qualitative material gathered in this fashion was worked into the various chapters dealing with distinct aspects or phases of the construction industry. Chapter 1 is the exception since, as the introductory chapter, it attempts to present the various measures of the size and scope of the construction industry's activities and as such the chapter is purely statistical in treatment.

We have tried to use, wherever possible, all the valuable information and insights obtained in the process of interviewing, and winnowing available records, either by incorporating the material directly into the report or using it as background for what does appear. It is our hope that we have done justice to the material so generously made available to us.

ACKNOWLEDGMENTS

In the preparation of this study we have received considerable assistance from a good many individuals in various organizations and companies. A list of their names would run to pages and might, at that, be incomplete because of the possibility of overlooking some in such a long list. To minimize this risk of omission, therefore, we have decided to list only the organization or company affiliation of those to whom we are indebted for help received.

Yet no such list can do justice to the degree of assistance we received, which impressed us more than anything else. We were particularly impressed by the generous response of those contractors upon whom we imposed our detailed and lengthy questionnaire.

However, none of those interviewed, and therefore none of the organizations or companies noted below, are in any way responsible for the final form of this study, and for what errors and omissions it may contain, or for our interpretation of what information we received from them.

The following list of the affiliations of those to whom we are indebted does not include the 64 construction firms who responded so splendidly to our general questionnaire, as these firms were assured of complete anonymity in order to encourage as wide and frank a response as possible.

Government Agencies or Departments

Central Mortgage and Housing Corporation

Defence Construction (1951) Limited

Department of Labour, Canada

Department of National Revenue, Taxation Division, Canada

Department of Public Works, Canada

Department of Trade and Commerce, Economics Branch, Canada

Dominion Bureau of Statistics

National Research Council, Division of Building Research

Ontario Planning and Development Department, Province of Ontario

Workmen's Compensation Board, various provinces

Associations

Builders' Exchange Inc., Montreal

Building and Construction Trades Council of Montreal and Vicinity

Canadian Construction Association

Canadian Tax Foundation

Lumbermen's Credit Bureau, Inc., Toronto

Montreal Building Trades Apprenticeship Centre

National Association of Master Plumbers and Heating Contractors of Canada

National House Builders Association

Ontario General Contractors Association

Ontario Road Builders' Association

Toronto Builders Exchange

Trades and Labour Congress of Canada

United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada

Other Organizations

John Caron Construction Inc.

Dun and Bradstreet of Canada, Limited

Fidelity Real Estate Corporation

The Financial Post

Hugh C. MacLean Publications Limited

Manufacturers Life Insurance Company, Mortgage Loan Department

Montreal Trust Company, Mortgage Department

Alexander Murray and Company Limited

Royal Commission on Canada's Economic Prospects

Siporex Limited

Westmount Realties Company

CONTENTS

LIST OF TABLES

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

1

CONSTRUCTION ACTIVITY IN CANADA [1]

THIS CHAPTER outlines the broad features of construction *activity* in Canada and its significance for the economy as a whole. The purpose is to provide a background for the discussion of the Canadian construction *industry* in the chapters which follow.

Construction work in Canada reflects the activity of many groups, generally divisible into the broad categories of general and trade contractors, business and industry, governments and private individuals. They are organized into a composite of thousands of units of varying size and structure. A substantial proportion of these units is occupied solely or mainly in carrying on some form of construction activity and constitutes the construction industry proper; but a good many other units also doing construction work do not properly belong to the construction industry. In this category are owner-builders, government departments and some industrial corporations which do their own construction work. The problem of defining construction activity and the construction industry is discussed in greater detail in Chapter 2.

New and Repair Construction

Table 1 [2] gives the value of new and repair construction work performed in Canada by all groups in each of the last 30 years.

Construction work in Canada during the postwar period has grown in value by 235%, with the total value of all work performed in Canada during the years 1946 to 1955 totalling $34.5 billion. About two-thirds of these expenditures, or approximately $22.5 billion, took place in the latter half of the period. Even after allowing for rising costs, the physical volume of construction work about doubled between 1946 and 1955. Over the same period Gross National Product, in constant dollars, increased by only 42%. For the decade 1946 to 1955 as a whole, the value of new construction amounted to $26.4 billion (of current dollars), or more than three-quarters of total construction expenditures. This was almost two-thirds of the $42.2 billion directed into capital spending (new construction plus new machinery

[1] Data on construction expenditures used in this study were taken from two different sources, namely *Private and Public Investment* and *Construction in Canada*. The two sources do not always give exactly the same figures for corresponding years and this explains any differences in the figures on construction expenditures for certain years in some of the tables used in this study.

[2] Tables for Chapter 1 may be found grouped at the end of the chapter.

and equipment expenditures) during the decade. In addition, repair construction over the same period totalled $8.1 billion. The *volume* of new and repair construction since 1947 is given in Table 2.

As repair construction is by its nature a function of the new construction of previous years, the recent high levels of new construction will inevitably increase repair construction in the future. However, the distribution of this repair construction over the years to come cannot be assessed, as the length of the lag between new and repair undertakings is not precisely known. In past years repair construction, especially for residential purposes, has been capable of a certain amount of adjustment to economic conditions; this may be expected to continue into the future. But there is always a core of repair activity which cannot be postponed and which provides a stabilizing influence for the industry. Any modification of construction activity which favours the elements characterized by greater stability of repair operations is a step toward the elimination of the cyclical ups and downs which have plagued the industry. Offsetting the effect of increased new construction in raising the demand for repair work is the fact, pointed out by a representative of the Toronto Builders Exchange in an interview, that new materials and techniques tend to reduce repair and maintenance work in modern buildings. This comment was qualified by the statement that the increased volume and complexity of mechanical and electrical work demanded more repair and maintenance.

Table 3 gives the value of residential and non-residential construction for the years 1926 to 1955. Over the decade 1946 to 1955 about two-thirds of new construction expenditures were for non-residential purposes. The value of non-residential repair construction amounted to 35% of new non-residential construction for the period 1946 to 1955. The ratio of expenditures for repair to expenditures for new work for residential construction is, on the average, much lower — less than 25%. It seems likely that the importance of repair construction during future years will increase as a result of the large volume of new non-residential construction in recent years.

Major Types of Construction

Some idea of the relative importance of the major types of construction can be gained by an examination of Table 4. In the last five years the total value of construction work performed in Canada amounted to approximately $22.5 billion, of which $17.7 billion went for new work and $4.9 billion for repairs. Building construction, valued at $13.8 billion, was more important than total engineering construction and constituted 61% of all construction expenditures. Residential, industrial, commercial and institutional building accounted for $12.5 billion, or just over half of the value of all construction.

Engineering construction contributed $8.7 billion, or 39%, to total construction work during the period 1951 to 1955. Many new engineering construction projects were undertaken in connection with the building of roads, highways, airports and electric power installations. The high proportion of engineering repair activities reflects projects relating to railway, telephone and telegraph facilities, roads, highways and airports. Other types of engineering construction, with the exception of new gas and oil projects, accounted for less than 5% of the value of construction, whether in relation to the total or in relation to the new and repair components.

Residential Building

From 1946 to 1955 a total of $8 billion was spent on the construction of new single and double dwellings, duplexes and apartment houses. This included the completion of 866,770 new dwellings, which corresponded to a net family formation of approximately 843,200 over the period. On the basis of the number of new dwelling units completed in 1955, which numbered about 127.6 thousand, it was expected that by the end of 1956 nearly one million new units would have been completed since the *end* of 1945, bringing the total number of occupied dwelling units in Canada close to four million. Actually, since VE Day in 1945, more than one million new dwellings have been completed. The number of dwelling units started and completed each year from 1935 to 1955 is given in Table 5.

Of total expenditures on residential construction over the 1946-55 decade, more than three-quarters were for new structures. Major improvements and alterations to existing housing, which provided other new dwelling accommodation, accounted for about 6% of expenditures on residential construction, while repairs accounted for about 18% (see Table 6).

Table 7 lists the number and proportion of new dwelling completions according to urban, rural and non-farm location, for each year from 1947 through 1955. Urban centres accounted for nearly 80% of the total of dwelling units completed over the 1947-55 period. Reflecting population distribution, the major portion of residential building activity from 1948 to 1955 occurred in Ontario and Quebec. Table 8 gives some indication of the relative distribution of new dwelling units among 13 major metropolitan areas of Canada, over the years 1946 to 1955.

Emphasis on the types of residential construction has varied over the postwar period (Table 9), but about three-quarters of the completions have been of the one-family type, with apartment houses the next most popular form for completions. While one-family completions as a percentage of total completions fell from about 80% in 1947 to about 71% in 1955, apartment completions rose from about 10% of the total in 1947 to about 22% in 1955.

Non-Residential Building

Non-residential building covers industrial, commercial and institutional building, as well as some building which cannot be easily classified — such as non-residential farm buildings, broadcasting stations, passenger terminals, armouries, etc. The value of non-residential building over the postwar decade as a whole cannot be precisely determined because of a change in the method of collecting the data adopted in 1951. Table 10 summarizes the available data going back to 1946, and covering the main components of non-residential construction.

Table 11 gives the distribution of the total value of non-residential building in more detail, by type of structure, for the 1951-55 period. Most of the industrial building in this period consisted of the construction of factories, plants and workshops; these accounted for 84% of the value of industrial construction. Of commercial building, about 60% was accounted for by the construction of office buildings and retail and wholesale stores. The building of warehouses, storehouses and refrigerated storage space has also been an important element in commercial building during recent years. In the institutional field, almost half of the value of construction in the 1951-55 period went to meet the growing requirements for schools and other educational buildings. Construction of hospitals and similar institutions accounted for just under one-third of the value of all institutional building.

Engineering Construction

Engineering construction includes the construction of roads, highways, airports, waterworks and sewage systems, dams and irrigation works, electric power, railway, telephone and telegraph, gas and oil facilities and other projects of a similar nature.

Table 12 summarizes the percentage distribution of total expenditures on engineering construction and Table 13 gives the current dollar-value distribution for the period 1951 to 1955.

Over the entire period the value of engineering construction amounted to $8.7 billion, of which $6.5 billion went into new work and $2.2 billion into repairs. The construction of roads, highways and airports is the most important component, accounting for more than a quarter of all engineering construction expenditures between 1951 and 1955. Within this category a little less than half the value of work done was for hard-surfaced or paved streets, highways or parking lots.

The second most important type of engineering construction over the period was electric power construction, which accounted for almost 20% of the total. Indications are that construction of electric power facilities has been maintained at about the same proportion of total engineering value in recent years as over the 18 years prior to 1951.

The construction of railway, telephone and telegraph facilities involved expenditures estimated at $1.5 billion during the period 1951 to 1955. In all, these expenditures accounted for about 17% of total engineering construction.

During recent years construction of gas and oil facilities has accounted for more than 13% of engineering construction expenditures, reflecting the development of Canadian gas and oil fields in the West. The drilling of oil wells during these five years was the main form of activity, accounting for 40% of the total spent on gas and oil projects.

Waterworks and sewage systems accounted for about 8% of all engineering construction projects in the period 1951 to 1955. Expenditures on marine construction amounted to only 4% and dams and the completion of irrigation programmes amounted to even a smaller proportion of the total.

Another and different source of data on non-residential construction is the series on number of construction contracts awarded in Canada, published in the *MacLean Building Reporter*. This series for the period 1946 to 1954 is shown in Table 14. It shows, in effect, the number of work starts (or contracts awarded) for different types of projects including both new and repair jobs.

The surprising feature of these figures is the stability in the total number of non-residential contracts awarded since 1947 contrasted with marked changes in some of the components. Contracts for institutional building more than doubled, schools leading the rise with an increase of 168%, and engineering contracts increased by 80%. Over the same period the number of contracts for business construction declined 18% and industrial contracts fell by 39%.

Regional Distribution

Because of uncertain coverage, the reliability of the regional data is not as great as for data relating to all Canada. Consequently, Table 15, which gives the regional distribution of construction expenditures for the period 1951 to 1955 (based on the series *Construction in Canada*) and for the period 1946 to 1950 (based on the series *The Construction Industry in Canada*), must be used with caution. Two broad changes stand out: an increased share in the value of construction undertakings in Alberta, probably due to the oil boom, and a decreased share in Ontario in the latter half of the decade. During the five-year period 1951 to 1955, more than a third of the $22.5 billion spent on construction in Canada represented work put in place in Ontario, and about one-fourth work put in place in Quebec.

Table 16 gives a more detailed breakdown of construction in the various regions, indicating the distribution of expenditures by type of activity within each region. Building activity varied across Canada from 53% of provin-

cial construction expenditures in British Columbia to 67% in Ontario. In general, Ontario and Quebec directed the largest share of construction funds into building, while the western provinces gave the least emphasis to this type of work. Residential building was the largest component of building activity in every region. Emphasis on industrial building was greatest in Ontario and least in the Prairies, while institutional building accounted for a larger share of construction expenditures in Quebec than in other regions.

Engineering construction accounted for nearly half of all construction expenditures in the western provinces. Electrical power projects varied in importance from 12% of the value of construction in British Columbia to 4% in the Atlantic Provinces and the Prairies. Marine construction was naturally of most importance in the Atlantic Provinces, where it accounted for more than 6% of construction expenditures.

The series on construction contracts awarded, published by MacLean, is also available on a regional basis by years. Results of the MacLean's survey for the 1946-55 decade, which are given in Table 17, substantiate the more obvious variations among the regions noted in Table 16.

Public and Private Construction

Construction work in Canada can be classified not only by type of activity but also by nature of ownership, namely, public or private.

Public construction represents all construction put in place by or for any government agency or department — federal, provincial or municipal. Private construction consists of all construction undertaken by or for private individuals, business, industry, charitable organizations and all other non-governmental (or private) bodies.

Table 18 gives the percentage distribution between public and private construction for the years 1926 to 1956. On the average, public construction represented 33% of all construction work in the five-year period 1946 to 1950; for 1951 to 1956 it averaged 36%.

It is difficult to distinguish any reliable trend in the relative importance of public as opposed to private construction work over the years 1926 to 1950; special influences in certain periods have affected the trend. During prosperous years construction expenditures by municipal and provincial governments tended to increase as their revenues rose, while federal construction expenditures tended to gain in relative importance during war years and other periods when the volume of private construction was depressed. Thus, during the depressed years of the 1930's, the value of public construction rose to almost 43% of all construction, largely because federal outlays for construction purposes, while declining, fell by much less than private construction. Again, in the war years of the 1940's, because of defence needs, a very large portion of all new construction was accounted

for by federal projects. The *proportion* of public construction to the total naturally fell sharply in the immediate postwar years, but started to climb once more in 1948 because of increased construction activity at all levels of government.

Table 19 shows the elements which compose total and new construction, according to the private or public character of the work performed, during the period 1951 to 1955. Of total public construction, work done for or by provincial governments accounted for the largest share, about 38%; work for or by the federal government accounted for 32% of public construction; and work for municipal governments accounted for 30%.

During 1951-55, work completed for the federal government was primarily for or by federal departments and departmental agencies, which accounted for 62% of total federal expenditures on construction during the period but for only about 7% of all public and private construction. Federal government enterprises — i.e., government-owned establishments whose funds are primarily derived from the provision of goods and services to the public—accounted for 30% of total federal construction expenditures, but for only 3.4% of all construction expenditures. The balance of federal expenditures on construction (about 7%) was accounted for by institutions operated by the federal government.

Total federal construction expenditures accounted for little more than one-tenth of all construction expenditures in the period. In the United States, in 1954, new federal direct construction expenditures were little more than 9% of total new construction, a smaller percentage than in Canada.

Table 20 indicates the distribution of construction expenditures at all three levels of government. Government departments were responsible for about 57% of new government work and 55% of repair work. Much of the repair work initiated by government departments was on a provincial level and involved the maintenance or roads and highways. Of the new construction put in place, activity on the federal level by government departments was the largest component.

A summary of the most important features of federal government construction expenditures for the fiscal years 1952 to 1955, which is given in Table 21, indicates clearly the overwhelming share of construction work initiated by the Departments of National Defence, Public Works, Defence Production and Transport. During the last five years, Defence Construction (1951) Limited, an agency corporation of the Crown, has handled over 40% of all federal construction expenditures other than housing. This agency completes no work itself but lets out construction work to private contractors, chiefly by public tender, mainly on behalf of the Departments of National Defence and Defence Production. Construction expenditures made under the direction of this agency totalled $670 million over the last five years, and are included in the departmental figures given in Table 21.

A major portion of the construction work initiated at all levels of government is let out for contract. Table 22 indicates the value of work performed by government departments each year from 1951 to 1955, and the amount of that work which was completed by the labour force of those departments. Less than 40% of the work completed was put in place by the labour force of government departments, the remainder being let out to private contractors. Comparable data are not at hand for non-departmental government units but it is known that in these cases as well a major portion of construction work put in place is completed by private contractors. The largest proportion of own-account work in relation to the total initiated occurs at the municipal level and the smallest at the federal level.

Construction by Industrial Sector

Table 23 indicates the distribution of building and engineering construction expenditures by major industrial sectors of the Canadian economy over the period 1951 to 1955. Housing accounted for the largest share — 29% of the total. Construction expenditures by government departments and by utilities came next with about 20% each. Expenditures of other industrial sectors ranged in size from 9% of the total for manufacturing to a fractional percentage for the construction industry proper.

Share of Construction Work Performed by the Industry

Table 24 illustrates the distribution of construction work performed by the construction industry proper and by other groups in Canada during the period 1951 to 1955. During these five years the construction industry put in place construction work valued at $16.3 billion, while other groups accounted for the balance of $6.2 billion. While more than half the value of *repair* construction was put in place by groups outside the industry, the construction industry itself accounted for about four-fifths of all *new* construction. The trend from 1951 to 1955 was for the construction industry to do an increasing share of new construction work. But, as Table 25 indicates, certain sectors of the economy do a significant amount of their own construction work. Utilities complete by far the highest proportion of their own construction requirements, averaging 60.1% over 1951-55. Governments met 37% of their construction needs with their own labour force, and other groups 14%.

Construction and the Canadian Economy

Over the past 30 years, as indicated by Table 26, new construction expenditures have represented between 50% and 70% (averaging 61.6% over the period) of total capital expenditures. The major portion of this new construction has been in the non-residential field which, since 1926, has averaged more than 40% of the value of capital investment.

The importance of these facts for the economy can be assessed by relating them to G.N.P., as in Table 27. Over the period 1926 to 1955, construction expenditures averaged 11.7% of G.N.P. During the postwar decade especially, expenditures on new construction have constituted a gradually increasing proportion of G.N.P., rising from 8.8% in 1946 to 16.0% in 1955. With new construction in recent years accounting for more than 15% of G.N.P. and approaching 70% of total capital investment, construction activity has made a substantial contribution to the well-being of the Canadian economy, in terms of the capital which it puts to work and in terms of the direct demand which it creates for construction materials and the derived demand for other products, as well as in terms of the employment which it creates directly and indirectly.

Another measure of the importance of construction in the national economy is given by the series on net value of production of various industries published by the Dominion Bureau of Statistics (D.B.S.). Net value of production, or value added, is generally considered to be a better measure of output than gross value of production, and is derived by deducting from the gross value of production the cost of materials, fuel, and purchased electricity consumed in the production process.

The net value of construction production has climbed substantially in importance in the last ten years, increasing from 11% of the net value of production for all commodity-producing industries in 1946 to 17% in 1953, the latest year for which data are at present available. As Table 28 indicates, there has been a much higher rate of growth in the net value of construction in Canada for most years since 1945 than for manufacturing production.

Although the quality of the estimates for provincial distribution of net value of construction is uncertain, the available information suggests that growth in construction activity has not been even throughout the country. During recent years it appears that construction has consistently played a smaller role in the contribution to total net value of production in some provinces than in others. In British Columbia, Newfoundland, Alberta, Nova Scotia, Manitoba and New Brunswick construction plays a more important role than in the economy as a whole, while in Ontario and Quebec construction is of lesser relative importance, owing to the greater importance of manufacturing in the central provinces.

However, a low contribution of construction to the total net value of production in Ontario and Quebec understates the importance of the industry to the provincial economy if the demand from all parts of Canada, for construction materials produced in these two provinces is overlooked. Actually only Quebec, Ontario and British Columbia are net exporters of construction materials, and all the other provinces are net importers. It has been estimated that while these three provinces have accounted for more than 70% of the construction work put in place in Canada in recent years, they

have produced about 90% of the total requirement for construction materials. The geographical disparity between the production and use of construction materials is gradually being narrowed with the growth of new plants which process building products closer to the site.

The contribution of the construction industry to net national income at factor cost has been over 6% in recent years, whereas it was less than 4% from 1933 to 1945 (see Table 29). In 1955 the industry contributed 7% of net national income, a higher proportion than in any of the last 30 years. The only other occasion since 1926 when the construction industry's contribution to national income approached the levels of recent years was in the boom year of 1929, when it was 6.1%. The contribution of other industries to the net national income in the years 1954 and 1955 is shown in Table 30. This shows that the construction industry's contribution to national income is almost as great as that of agriculture and that it ranks ahead of most other industries in this respect.

Table 31 shows the distribution of the net national income in the construction industry by its components of wages, profits and investment income for the years 1950 to 1955.

Growth in Construction Output

How real is the construction "boom" which has developed in Canada during the postwar decade? This question may perhaps be answered by comparing the growth in construction expenditures with other indicators of over-all growth in the economy. Construction activity can hardly be said to have been experiencing a boom unless it has grown at a rate substantially in excess of the rate of growth of the economy as a whole, as indicated by the increase in G.N.P.

Table 32 gives the current dollar values for some major indicators of economic growth for each year of the postwar decade. The value of new construction is also listed along with its division into residential and non-residential construction and into public and private expenditures. The value of new construction has shown a greater increase between 1946 and 1955 than any of the other major indicators in Table 32. Compared with a 304% growth in new construction, capital investment has increased by 266%, and the total value of construction by 235%. All have increased more rapidly than G.N.P., whose level in 1955 stood 123% above that of 1946. The breakdown of new construction activity indicates that the value of non-residential construction increased 331% between 1946 and 1955, while residential construction increased by 262%. New public construction showed the highest rate of increase of all, rising to a level in 1955 which was 338% above that of 1946. This compared with an increase of 289% in new private construction over the decade. In current dollars, then, construction activity has been of boom proportions in the postwar period.

To assess fully the nature of the current construction boom, corrections should be made for population growth and price changes, and comparisons should be made with previous periods of high construction activity. In order to do this, annual average construction expenditures over the five-year periods, 1926 to 1930, 1946 to 1950, and 1951 to 1955, have been computed, expressed in terms of constant 1935-to-1939 dollars and corrected for population. This was done by converting public and private construction expenditures for new residential and non-residential construction into constant 1935-to-1939 dollars, using the implicit price deflators for new residential and new non-residential construction in the *National Accounts*. Repair construction was converted to a constant dollar basis by making the same proportionate adjustment to its current value as constant dollar new construction bore to its current value. Constant dollar value of total construction expenditures is, of course, the sum of the constant dollar value of new and repair construction. The resulting figures were then divided by population. The following figures express the results and compare them to the comparable figures for G.N.P.

Annual Average Construction Expenditures, in Canada, per Unit of Population, in Constant (1935-39) Dollars

	1951-55	1946-50	1926-30
All Construction	126	105	94
Repair construction	28	29	26
New construction	98	76	68
New residential construction .	26	24	21
New non-residential const. ..	72	52	47
G.N.P. per person	799	733	514

These figures show that in the last five years construction activity, on a constant dollar and population basis, has been much greater than in the 1946-50 or the 1926-30 period. While the long-run increase in construction has not been as great as that of constant dollar G.N.P. per person, the rise between 1946-50 and 1951-55 has been, as we indicated earlier, appreciably greater than that of real national output. The present construction boom, which the above figures indicate we have, is a new-construction boom, as repair-construction expenditures show little change from the earlier period. Further, most of the expansion is concentrated on new non-residential construction. While new non-residential construction was over 50% higher than in the boom of 1926 to 1930, constant dollar expenditures on new housing have increased only moderately despite the large number of new houses built in the last ten years.

The adequacy of the volume of residential construction put in place in Canada over the last ten years and of the size of the existing housing stock is difficult to assess, but comparisons with other countries offer a guide. The volume of new residential construction work in this country over the last nine years compared with that in the United Kingdom and the United States is shown in Table 33. On a population basis, the number of new dwellings completed in Canada exceeded such completions in the United Kingdom. Compared with the United States (for which only housing starts is available), however, the number of new non-farm housing starts per thousand of non-farm population in Canada has been less favourable. In four of the last nine years these starts, on a population basis, have been less than in the United States and over the period as a whole the Canadian figure is below that for the United States. Further, the stock of dwellings per thousand of inhabitants is less in Canada than in a good many other countries including the United Kingdom and the United States. However, it is to be expected that the Canadian figure for housing stock on a population basis would be less than for older countries. The table below presents the housing stock–population data. While these international comparisons do not throw doubt on the adequacy of the Canadian housing programme, neither do they reveal a particularly outstanding performance. Of course, differences in quality and size of dwelling units in Canada and other countries might affect this conclusion, but no data are available on this.

Dwellings per Thousand of Population, Selected Countries, 1954

Country	Number	Country	Number
Belgium	347	Italy	250
Canada	244	Norway	279
Czechoslovakia	293	Soviet Union	195
Denmark	312	Sweden	342
France	288	Switzerland	282
Great Britain	282	United States	318
Holland	230		

SOURCE: European data taken from the Business News Survey of the Swiss Bank Corporation (No. 51, June, 1956) who reproduce the data from the study of *The European Housing Situation* by the Economic Commission for Europe.

Canadian figure computed from Central Mortgage and Housing Corporation data. U.S. figure estimated on the basis of information found in *America's Needs and Resources*, by J. F. Dewhurst and Associates (The Twentieth Century Fund).

Statistical Tables

Table 1

VALUE OF CONSTRUCTION WORK PERFORMED IN CANADA[a] 1926-55

(values in millions of dollars)

Year	Total		New		Repair	
	Value	Percentage	Value	Percentage	Value	Percentage
1955.....	5,288	100	4,273	80.8	1,015	19.2
1954.....	4,694	100	3,680	78.4	1,014	21.6
1953.....	4,637	100	3,665	79.0	972	21.0
1952.....	4,175	100	3,263	78.2	912	21.8
1951.....	3,661	100	2,735	74.7	926	25.3
1950.....	3,132	100	2,366	75.5	766	24.5
1949[b].....	2,817	100	2,102	74.6	715	25.3
1948.....	2,537	100	1,858	73.2	679	26.8
1947.....	1,992	100	1,412	70.9	580	29.1
1946.....	1,580	100	1,058	67.0	522	33.0
1945.....	1,189	100	700	58.8	489	41.1
1944.....	1,131	100	679	60.0	452	40.0
1943.....	1,267	100	890	70.2	377	29.8
1942.....	1,248	100	901	72.1	347	27.8
1941.....	1,123	100	803	71.5	320	28.5
1940.....	855	100	579	67.5	276	32.3
1939.....	744	100	480	64.5	264	35.5
1938.....	722	100	467	64.7	255	35.3
1937.....	768	100	519	67.6	249	32.4
1936.....	619	100	387	62.5	232	37.5
1935.....	551	100	337	61.2	214	38.8
1934.....	490	100	282	57.6	208	42.4
1933.....	417	100	229	54.9	188	45.1
1932.....	537	100	326	60.7	211	39.3
1931.....	847	100	592	69.9	255	30.1
1930.....	1,064	100	785	73.8	279	26.2
1929.....	1,194	100	893	74.8	301	25.2
1928.....	1,076	100	783	72.8	293	27.2
1927.....	902	100	633	70.2	269	29.8
1926.....	787	100	544	69.1	243	30.9

a Data on construction expenditures used in this study were taken from two different sources, namely *Private and Public Investment* and *Construction in Canada*. The two sources do not always give exactly the same figures for corresponding years and this explains any differences in the figures on construction expenditures for certain years in some of the tables presented in this study.

b Newfoundland not included before 1949.

SOURCE: Data for the years 1926-49 have been calculated on the basis of data in Department of Trade and Commerce, *Private and Public Investment in Canada, 1926-1951*. Data for 1950 and later years are from Department of Trade and Commerce, *Private and Public Investment in Canada, Outlook*, various years. Data for the later years are subject to revision, in Table 1 and subsequent tables. An adjustment has been made to exclude government expenditures on resource development and conservation.

Table 2

NEW, REPAIR, AND TOTAL CONSTRUCTION IN CONSTANT DOLLARS, 1947-55

(millions of 1949 dollars)

Year	New	Repair	Total
1947[a]	1,681	696	2,377
1948[a]	1,947	720	2,667
1949	2,124	732	2,856
1950	2,247	727	2,974
1951	2,308	783	3,091
1952	2,616	730	3,346
1953	2,824	749	3,573
1954	2,852	787	3,639
1955[b]	3,200	755	3,955

a Construction work in Newfoundland not included.

b Preliminary.

SOURCE: D.B.S., *Construction in Canada, 1954-1956*, p. 6.

Table 3

VALUE OF RESIDENTIAL AND NON-RESIDENTIAL CONSTRUCTION, NEW AND REPAIR, 1926-55

Year	Residential			Non-Residential		
	New	Repair	Percentage of repair to new	New	Repair	Percentage of repair to new
	(millions of dollars)			(millions of dollars)		
1955	1,496	238	15.9	2,777	777	28.0
1954	1,178	222	18.8	2,502	792	31.7
1953	1,084	214	19.7	2,581	758	29.4
1952	826	203	24.6	2,437	709	29.1
1951	821	221	26.9	1,914	705	36.8
1950	845	191	22.6	1,521	575	37.8
1949[a]	776	176	22.7	1,326	539	40.6
1948	668	162	24.3	1,190	517	43.4
1947	540	131	24.3	872	449	51.5
1946	413	105	25.4	645	417	64.7
1945	286	96	33.6	414	393	94.9
1944	237	92	38.8	442	360	81.4
1943	204	88	43.1	686	289	42.1
1942	223	87	39.0	678	260	38.3
1941	244	77	31.6	559	243	43.5
1940	200	63	31.5	379	213	56.2
1939	185	57	30.8	295	207	70.2
1938	159	53	33.3	308	202	65.6
1937	175	55	31.4	344	194	56.4
1936	139	50	36.0	248	182	73.4
1935	114	46	40.4	223	168	75.3
1934	98	44	44.9	184	164	89.1
1933	76	40	52.6	153	148	96.7
1932	96	40	41.7	230	171	74.3
1931	168	46	27.4	424	209	49.3
1930	204	52	25.5	581	227	39.1
1929	247	56	22.7	646	245	37.9
1928	236	54	22.9	547	239	43.7
1927	217	50	23.0	416	219	52.6
1926	212	49	23.1	332	194	58.4

a Newfoundland not included before 1949.

SOURCE: Data for the years 1926-49 have been calculated on the basis of data in Department of Trade and Commerce, *Private and Public Investment in Canada, 1926-1951*. Data for 1950 and later years are from Department of Trade and Commerce, *Private and Public Investment in Canada, Outlook*, various years. An adjustment has been made to exclude government expenditures on resource development and conservation.

Table 4

DISTRIBUTION OF VALUE OF TOTAL, NEW AND REPAIR CONSTRUCTION BY COMPONENT TYPES OF CONSTRUCTION, 1951-55[a]

(values in millions of dollars)

Type of Construction	Total		New		Repair[b]	
	Value	Percentage	Value	Percentage	Value	Percentage
Total Construction	22,508	100.0	17,655	100.0	4,853	100.0
Total Building Construction	13,821	61.4	11,169	63.2	2,652	54.6
Residential	6,502	28.9	5,405	30.6	1,097	22.6
Industrial	1,991	8.8	1,531	8.7	460	9.5
Commercial	2,263	10.1	1,943	11.0	320	6.6
Institutional	1,786	7.9	1,557	8.8	229	4.7
Other building construction	1,279	5.7	734	4.2	545	11.2
Total Engineering Construction	8,687	38.6	6,486	36.8	2,201	45.4
Road, highway and airport construction	2,306	10.2	1,637	9.3	669	13.8
Waterworks and sewage systems	723	3.2	615	3.5	109	2.2
Dams and irrigation	224	1.0	202	1.1	22	0.5
Electric power construction	1,722	7.7	1,561	8.8	161	3.3
Railway, telephone and telegraph construction	1,463	6.5	595	3.4	868	17.9
Gas and oil facilities	1,140	5.1	1,052	6.0	88	1.8
Marine construction	333	1.5	262	1.5	70	1.4
Other engineering construction	777	3.5	561	3.2	216	4.5

a Because of rounding, totals may not add to the exact sum of components. Data on a comparable basis (with the exception of residential construction) are not available for earlier years as the basis of collection of information was changed in 1951.

b Value figures for repair construction were derived by subtracting the value figures for new construction from those for total construction.

SOURCE: Computed from data in D.B.S., *Construction in Canada*, various issues.

Table 5

DWELLING UNITS STARTED AND COMPLETED, 1935-55[a]

Year	Starts	Completions[b]	Conversions
1955	138,276	127,552	4,340
1954	113,527	101,965	4,373
1953	102,409	96,839	3,824
1952	83,246	73,087	3,215
1951	68,579	81,310	3,500
1950	92,531	89,015	2,739
1949[c]	90,509	88,233	3,422
1948	90,194	76,097	5,146
1947	74,263	72,218	7,013
1946	64,355	60,454	6,740
1945	55,181	42,488	5,982
1944[d]	41,500	36,500	6,300
1943	36,100	32,700	4,100
1942	40,000	42,800	4,400
1941	51,200	53,200	3,600
1940	52,600	49,000	3,500
1939	48,900	48,800	2,900
1938	43,900	41,400	2,600
1937	45,100	46,900	1,700
1936	41,000	38,000	1,300
1935	33,900	31,800	1,100
Total 1935-1955	1,407,270	1,330,358	81,794
Total 1946-1955	917,889	866,770	44,312

a Excludes the Yukon and Northwest Territories.

b Excludes conversions.

c Newfoundland excluded before 1949.

d Figures for 1944 and prior years are based on less precise estimating methods than those for subsequent years and are estimated to the nearest hundred only.

SOURCE: Central Mortgage and Housing Corporation, *10th Annual Report, 1955* (Table 1), *Housing in Canada* (4th Quarter, 1954, Table 1), and *Canadian Housing Statistics* (4th Quarter, 1955, Table 1). O. J. Firestone *Residential Real Estate in Canada*, Table 67.

Table 6

EXPENDITURES ON NEW RESIDENTIAL CONSTRUCTION, MAJOR IMPROVEMENTS, REPAIRS AND MAINTENANCE, IN CANADA[a], 1946-55

(millions of dollars)

Year	New residential construction[b]	Major improvements and alterations	Repairs and maintenance	Total
1955....	1,382.5	113.2	238.0	1,733.7
1954....	1,088.9	89.1	221.8	1,399.8
1953....	1,007.2	76.5	213.6	1,297.3
1952....	765.0	60.6	203.2	1,028.8
1951....	752.8	68.8	221.0	1,042.6
1950....	782.7	60.6	191.0	1,034.3
1949[c]...	726.8	48.2	176.0	951.0
1948....	628.7	39.0	161.9	829.6
1947....	506.1	33.6	130.8	670.5
1946....	390.2	21.8	105.3	517.3
1946–55.	8,030.9	611.4	1,862.6	10,504.9

a There is an unexplained discrepancy of $4.7 million in the total value of new residential construction (including major improvements and alterations) over the years 1946-55 between Table 6 and Table 26, based on estimates prepared by the Department of Trade and Commerce and published in various issues of *Private and Public Investment in Canada*. The yearly figures for total new residential construction shown in Tables 3 and 26 differ slightly from those which may be derived from the above table by adding the figures for major improvements and alterations to those for new residential construction.

b Includes activities of private construction agencies, government departments, Crown companies, and non-departmental government agencies.

c Newfoundland not included before 1949.

SOURCE: Central Mortgage and Housing Corporation, *Canadian Housing Statistics* and *Housing in Canada* various issues.

Table 7

NEW PERMANENT DWELLINGS COMPLETED, BY URBAN AND RURAL AREAS[a], 1947-55

(exclusive of conversions)

Year	Urban	Percentage of all completions	Rural (farm and non-farm)	Percentage of all completions	Total non-farm	Percentage of all completions
1955.....	101,648	79.7	25,904	20.3	123,374	96.7
1954.....	86,669	85.0	15,296	15.0	98,838	96.9
1953.....	80,226	82.9	16,613	17.2	93,282	96.3
1952.....	58,918	80.6	14,169	19.4	68,541	93.8
1951.....	65,387	80.4	15,923	19.6	77,641	95.5
1950.....	70,522	79.2	18,493	20.8	84,970	95.5
1949[b].....	68,873	78.1	19,360	21.9	83,006	94.1
1948.....	58,035	76.3	18,062	23.7	72,239	94.9
1947.....	51,756	71.7	20,462	28.3	67,847	93.9
1947–55....	642,034	79.6	164,282	20.4	769,738	95.5

a Excludes the Yukon and Northwest Territories.

b Newfoundland not included before 1949.

SOURCE: Central Mortgage and Housing Corporation, *Canadian Housing Statistics* and *Housing in Canada*, various issues.

Table 8

NEW DWELLING UNITS COMPLETED, BY METROPOLITAN AREA, 1946-55

(exclusive of conversions)

Metropolitan area	1955	1954	1953	1952[a]	1951	1950	1949	1948	1947	1946	1946–55	Percentage
St. John's, Nfld.	435	451	585	402	326	299	—	—	—	—	2,498	0.3
Halifax, N.S.	1,275	1,360	1,241	636	620	708	780	471	371	665	8,127	0.9
Saint John, N.B.	295	273	273	211	98	332	345	134	457	242	2,660	0.3
Quebec, Que.	2,769	2,380	1,580	1,056	1,045	1,473	1,090	1,082	834	950	14,259	1.6
Montreal, Que.	19,923	16,191	17,833	11,500	16,316	15,826	14,394	8,814	6,184	3,571	130,552	15.1
Ottawa, Ont.	3,001	2,537	2,149	1,752	2,343	1,938	975	1,454	1,194	1,447	18,790	2.2
Toronto, Ont.	22,016	16,252	9,460	9,576	13,026	9,373	6,712	4,143	3,836	4,204	98,598	11.4
Hamilton, Ont.	2,932	2,593	2,961	1,877	1,757	1,511	1,900	1,317	1,141	640	18,629	2.1
London, Ont.	1,356	1,297	1,355	1,358	1,261	1,325	1,204	732	799	625	11,312	1.3
Windsor, Ont.	982	1,722	940	818	940	1,196	1,416	806	839	733	10,392	1.2
Winnipeg, Man.	4,181	3,602	3,089	2,088	2,127	3,070	3,228	2,881	3,242	1,966	29,474	3.4
Vancouver, B.C.	8,209	6,797	5,913	4,249	4,340	5,028	5,831	6,758	3,750	3,872	54,747	6.3
Victoria, B.C.	1,421	1,065	944	715	844	1,166	1,021	1,353	829	787	10,145	1.2
Total	68,795	56,520	48,323	36,238	45,043	43,245	38,896	29,945	23,476	19,702	410,183	47.3
Total Canada[b]	127,552	101,965	96,839	73,087	81,310	89,015	88,233	76,097	72,218	60,454	866,770	100.0

a The boundaries of the metropolitan areas listed in this table were changed slightly beginning in 1952 to agree with those set up for the 1951 Census.

b Excluding Yukon and Northwest Territories for the whole period and Newfoundland for 1946-48.

SOURCE: D.B.S., *The Canada Year Book*, various issues, *New Residential Construction*, various issues.

NEW PERMANENT DWELLINGS COMPLETED, BY TYPE OF UNIT, 1947-55[a]

(exclusive of conversions)

Year	One Family		Two Family		Row Houses		Apartments		Total	
	Number	Annual percentage	Number	Annual percentage	Number	Annual percentage	Number	Annual percentage	Number	Annual percentage
1955	90,292	14.9	8,278	13.9	1,547	23.8	27,435	20.4	127,552	15.8
1954	71,760	11.9	6,098	10.2	1,065	16.4	23,042	17.1	101,965	12.6
1953	68,916	11.4	7,714	13.0	372	5.7	19,837	14.7	96,839	12.0
1952	55,967	9.2	5,314	8.9	99	1.5	11,707	8.7	73,087	9.1
1951	60,366	10.0	7,568	12.7	585	9.0	12,791	9.5	81,310	10.1
1950	68,685	11.3	7,376	12.4	145	2.2	12,809	9.5	89,015	11.0
1949[b]	68,966	11.4	7,309	12.3	485	7.4	11,473	8.5	88,233	10.9
1948	61,787	10.2	4,560	7.7	1,607	24.7	8,143	6.0	76,097	9.4
1947	58,778	9.7	5,310	8.9	608	9.3	7,522	5.6	72,218	9.0
1947-55 Number	605,517	100.0	59,527	100.0	6,513	100.0	134,759	100.0	806,316	100.0
Percentage by type	75.1		7.4		0.8		16.7		100.0	

a Excludes the Yukon and Northwest Territories.

b Including Newfoundland from 1949.

SOURCE: Central Mortgage and Housing Corporation, *Canadian Housing Statistics* and *Housing in Canada*, various issues.

Table 10

VALUE OF NON-RESIDENTIAL BUILDING, 1946-50 AND 1951-55

(millions of dollars)

Type of Structure	Old Series (1946-50)[a]		New Series (1951-55)	
	Value	Percentage distribution	Value	Percentage distribution
All non-residential building	2,614	100.0	7,319	100.0
Industrial	1,096	41.9	1,991	27.2
Commercial	805	30.8	2,263	30.9
Institutional	624	23.9	1,786	24.4
Other	88	3.4	1,279	17.5

a Newfoundland not included before 1949.

SOURCE: D.B.S. *The Construction Industry in Canada*, various issues, and *Construction in Canada*, various issues.

VALUE OF NON-RESIDENTIAL BUILDING, BY TYPE, 1951-55[a]

Table 11

(thousands of dollars)

Type of Structure	1955	1954	1953	1952	1951	1951–55
All non-residential	1,639,922	1,513,991	1,514,812	1,381,902	1,268,663	7,319,290
Industrial	408,975	364,476	401,775	421,853	393,493	1,990,572
Factories, plants, workshops	348,594	301,338	332,487	361,694	336,713	1,680,826
Mine and mine mill buildings	33,963	31,630	33,374	24,648	29,090	152,705
Railway stations, offices, roadway buildings	15,607	17,070	19,746	17,808	17,151	87,382
Railway shops, engine houses, water and fuel stations	10,811	14,438	16,168	17,703	10,539	69,659
Commercial	529,748	546,339	501,781	325,945	359,225	2,263,038
Warehouses, storehouses, refrigerated storage, etc.	81,448	93,641	115,726	71,924	81,517	444,256
Grain elevators	14,959	19,118	18,956	14,805	8,263	76,101
Hotels, clubs, restaurants, cafeterias, tourist cabins	29,711	30,696	34,514	33,920	40,575	169,409
Office buildings	167,386	173,998	134,353	82,660	105,246	662,413
Stores, retail and wholesale	179,024	174,607	151,015	66,083	85,537	658,266
Garages and service stations	38,882	35,940	29,364	35,941	21,676	160,903
Theatres, arenas, amusement and recreational buildings	19,339	17,521	14,394	19,064	14,535	80,872
Laundries and dry cleaning establishments	2,999	1,858	2,460	1,648	1,876	10,818
Institutional	381,534	376,812	384,091	314,372	291,071	1,786,400
Schools and other educational buildings	224,424	215,724	156,161	152,201	122,267	830,787
Churches and other religious buildings	41,761	38,466	43,508	31,475	35,305	180,065
Hospitals, sanatoria, clinics, first-aid stations, etc.	106,116	122,717	121,068	98,349	80,456	562,694
Other institutional buildings	9,233	9,817	32,554	32,307	53,043	212,854
Other building construction	299,665	226,844	268,165	319,732	224,874	1,279,280
Farm buildings (excluding dwellings)	138,740	130,860	135,187	136,036	106,073	637,876
Broadcasting, radio and television, relay and booster stations, telephone exchanges	20,543	20,235	30,388	60,288	20,033	151,487
Airplane hangars	11,003	12,178	32,920	23,366	4,602	84,069
Passenger terminals, bus, boat or air	696	1,031	1,737	676	—	4,140
Armouries, barracks, drill halls, etc.	37,016	35,886	44,022	85,001	59,616	261,541
Bunkhouses, dormitories, cookeries, residence buildings	19,327	10,722	12,794	19,437	29,358	91,638
Other building construction	15,540	15,732	11,137	928	5,192	48,529

a Data for recent years are subject to revision.

SOURCE: D.B.S., *Construction in Canada*, various issues.

Table 12

DISTRIBUTION OF EXPENDITURES ON TOTAL ENGINEERING CONSTRUCTION, 1951-55

(percentage)

Type of Structure	1955	1954	1953	1952	1951	1951-55
Total engineering construction	100.0	100.0	100.0	100.0	100.0	100.0
Roads, highways and airport construction	26.6	26.2	25.6	27.6	27.0	26.5
Waterworks and sewage systems	9.5	10.1	7.4	7.6	6.4	8.3
Dams and irrigations	1.5	1.8	3.6	3.7	2.2	2.6
Electric power construction	17.2	17.8	18.5	21.6	25.8	19.8
Railway, telephone and telegraph construction	16.2	16.3	17.3	15.6	19.4	16.8
Gas and oil facilities	16.2	14.9	13.9	12.0	6.8	13.1
Marine construction	4.0	4.0	4.2	3.9	2.7	3.8
Other engineering construction	8.7	8.9	9.6	8.0	9.7	8.9

SOURCE: Computed from data in D.B.S., *Construction in Canada*, various issues.

VALUE OF ENGINEERING CONSTRUCTION PERFORMED, BY TYPE, 1951-55[a]

(thousands of dollars)

Type of Construction	1955	1954	1953	1952	1951	1951–55
Total engineering construction	1,911,929	1,809,476	1,827,533	1,787,719	1,350,489	8,687,146
Road, highway and airport construction	508,113	473,424	467,368	493,310	363,717	2,305,932
Hard-surfaced or paved streets, highways, parking lots, etc.	223,362	207,575	190,456	197,271	159,078	977,742
Gravel or stone streets, highways, roads, parking lots, etc.	141,496	129,228	122,352	114,988	83,745	591,809
Dirt, clay or other streets, roads, parking lots, etc.	40,288	33,431	26,760	34,823	38,609	173,911
Grading, scraping, oiling, filling	74,420	73,483	64,314	97,723	35,978	345,918
Sidewalks, paths	20,952	22,074	21,226	19,056	15,175	98,483
Airports, landing fields, runways, tarmac	7,595	7,633	32,022	24,056	17,088	88,394
Highway and roadside maintenance, guard rails	—	—	9,078	4,037	12,954	26,069
Road or highway surfacing and maintenance by railway companies	—	—	1,160	1,356	1,090	3,606
Waterworks and sewage systems	182,307	183,457	134,967	135,713	86,473	722,917
Tile drains, drainage ditches, storm sewers	30,810	30,127	18,159	19,291	10,152	108,539
Waterworks systems and connections	69,564	71,289	59,267	55,321	32,728	288,169
Sewage systems and connections	73,811	73,990	51,896	49,990	41,281	290,968
Pumping stations, water	5,172	3,753	4,561	6,827	—	20,313
Water storage tanks	2,950	4,298	1,084	4,284	2,312	14,928
Dams and irrigation	29,393	32,845	65,695	66,220	29,903	224,056
Dams and reservoirs	16,333	20,911	46,845	48,766	18,744	151,599
Irrigation and land reclamation projects	13,060	11,934	18,850	17,454	11,159	72,457
Electric power construction	328,425	321,870	338,054	385,679	347,966	1,721,994
Central electric stations, power plants, distribution lines	322,842	316,220	331,202	383,684	343,644	1,697,592
Street lighting[b]	5,583	5,650	6,852	1,995	4,322	24,402
Railway, telephone and telegraph	310,642	294,824	316,542	279,186	261,741	1,462,935
Railway track laying and surfacing, road maintenance, track	194,600	185,162	209,459	184,211	183,405	956,837
Signals and interlockers	5,254	8,232	9,425	9,725	8,577	41,213
Telegraph and telephone lines, underground and marine cables	110,788	101,430	97,658	85,250	69,759	464,885

Table 13 (cont'd)

VALUE OF ENGINEERING CONSTRUCTION PERFORMED, BY TYPE, 1951-55[a]

(thousands of dollars)

Type of Construction	1955	1954	1953	1952	1951	1951-55
Gas and oil facilities	309,572	269,787	253,117	214,967	92,400	1,139,843
Gas mains and services	14,014	7,313	8,813	—	—	30,140
Pumping stations, oil	3,662	8,669	9,098	10,953	6,405	40,913
Pumping stations, gas	423	1,048	371	284		
Oil storage tanks	16,370	15,944	17,519	14,453	7,408	85,429
Gas storage tanks	1,287	3,139	4,599	4,710		
Oil pipe lines	18,033	49,520	58,055	66,621	4,028	196,257
Gas pipe lines	22,687	14,254	9,265	8,485	9,386	64,077
Oil wells	119,727	89,777	72,695	66,801	55,568	448,930
Gas wells	16,100	8,518	12,567	7,177		
Oil refineries	94,994	68,451	58,926	34,617	9,605	266,593
Natural gas plants	2,275	3,154	1,209	866	—	7,504
Marine construction	77,212	72,443	76,061	70,111	36,761	332,588
Docks, wharves, piers, breakwaters	35,486	39,606	45,826	38,731	23,686	183,335
Retaining walls, embankments, riprapping	2,208	2,390	5,465	3,309	2,238	15,610
Canals and waterways	11,388	6,373	3,569	9,170	2,683	33,183
Dredging and pile driving	20,270	17,025	9,015	12,750	5,746	64,806
Dike construction	1,072	1,281	6,313	2,518	1,431	12,615
Logging booms	4,148	1,519	1,904	1,993	—	9,564
Other marine construction	2,640	4,249	3,969	1,640	977	13,475
Other engineering	166,265	160,826	175,729	142,533	131,528	776,881
Bridges, trestles, culverts, overpasses, etc.	84,962	78,243	67,571	61,332	60,587	352,695
Tunnels and subways	4,295	8,011	40,345	20,604	18,299	91,554
Incinerators	4,557	5,552	2,209	2,563	—	14,881
Park systems, landscaping, sodding, etc.	7,164	9,929	9,261	8,911	13,670	48,934
Swimming pools, tennis courts, outdoor recreational facilities	4,827	5,636	3,938	1,789	—	16,190
Mineshafts and other below-surface workings	25,001	22,270	24,296	15,517	14,068	101,152
Fences, snowsheds, signs	15,835	16,785	17,567	15,541	12,715	78,443
Other engineering construction	19,624	14,400	10,543	16,276	12,189	73,032

a Data for recent years are subject to revision.

b A portion of this item was included for the year 1952 under the preceding heading "Central electric stations, power plants, distribution lines".

SOURCE: D.B.S., *Construction in Canada*, various issues.

NUMBER OF CONTRACTS AWARDED FOR NON-RESIDENTIAL CONSTRUCTION, 1946-54

Type of Construction	1954	1953	1952	1951	1950[a]	1949	1948	1947	1946	1946–54
Churches	623	560	448	478	516	459	394	369	240	4,087
Hospitals	201	208	182	185	177	186	177	148	109	1,573
Public buildings	862	964	807	853	689	631	390	321	151	5,668
Schools	1,247	965	932	973	899	698	633	464	232	7,043
Total Institutional	2,933	2,697	2,369	2,489	2,281	1,974	1,594	1,302	732	18,371
Public garages	979	845	811	742	854	1,281	1,229	1,397	1,276	9,414
Hotels and clubs	614	710	653	920	1,068	749	790	781	377	6,662
Office buildings	1,154	1,057	725	965	964	934	1,002	684	385	7,870
Stores	1,863	2,146	1,842	2,103	2,615	2,794	3,246	2,767	2,122	21,498
Theatres	71	66	54	61	107	92	108	123	131	813
Warehouses	1,306	1,439	1,290	1,771	1,840	1,452	1,574	1,540	1,391	13,603
Total Business	5,987	6,263	5,375	6,562	7,448	7,302	7,949	7,292	5,682	59,860
Total Industrial	1,257	1,602	1,377	1,639	1,550	1,302	1,692	2,058	1,727	14,204
Bridges	270	225	197	241	200	116	139	115	61	1,564
Other engineering	2,489	3,117	2,498	2,606	2,435	1,596	1,393	1,423	996	18,553
Total Engineering	2,759	3,342	2,695	2,847	2,635	1,712	1,532	1,538	1,057	20,117
Total Non-Residential	12,936	13,904	11,816	13,537	13,914	12,290	12,767	12,190	9,198	112,552

a Newfoundland not included before 1950.

SOURCE: Computed from *MacLean Building Reporter*, various issues.

Table 15

VALUE OF CONSTRUCTION WORK PERFORMED, BY PROVINCE, 1946-50 AND 1951-55

(millions of dollars)

Province	1951-55				1946-50[a]			
	All construction		New construction		All construction		New construction	
	Value	Percentage	Value	Percentage	Value	Percentage	Value	Percentage
Canada	22,508.3	100.0	17,655.2	100.0	8,739.6	100.0	6,884.7	100.0
Newfoundland	338.8	1.5	1,133.4	6.4	32.4	0.4	24.5	0.4
Prince Edward Island	75.3	0.3			27.9	0.3	22.3	0.3
Nova Scotia	639.7	2.8			354.8	4.1	243.5	3.5
New Brunswick	547.3	2.4			264.6	3.0	192.8	2.8
Quebec	5,578.0	24.8	4,498.8	25.5	2,144.9	24.5	1,769.4	25.7
Ontario	7,946.5	35.3	6,214.9	35.2	3,544.7	40.6	2,795.7	40.6
Manitoba	1,122.4	5.0	3,781.7	21.4	459.2	5.3	350.4	5.1
Saskatchewan	1,169.6	5.2			312.1	3.6	224.2	3.3
Alberta	2,564.1	11.4			634.9	7.3	508.4	7.4
British Columbia	2,527.6	11.2	2,026.1	11.5	964.5	11.0	753.5	10.9

a Only 1949-50 for Newfoundland.

SOURCE: D.B.S., *Construction in Canada*, and *The Construction Industry in Canada*, various issues.

Table 16

CONSTRUCTION BY REGIONS, 1951-55[a]

(values in millions of dollars)

Type[b]	Canada		Atlantic Provinces[c]		Quebec	
	Value	Percentage	Value	Percentage	Value	Percentage
Total value	22,508	100.0	1,601	100.0	5,578	100.0
Total building	13,821	61.4	924	57.7	3,575	64.1
Residential	6,502	28.9	399	24.9	1,813	32.5
Industrial	1,991	8.8	110	6.9	463	8.3
Commercial	2,263	10.1	165	10.3	485	8.7
Institutional	1,786	7.9	134	8.4	552	9.9
Other	1,279	5.7	115	7.2	262	4.7
Total engineering	8,687	38.6	677	42.3	2,003	35.9
Roads, etc.	2,306	10.2	229	14.3	575	10.3
Waterworks, etc.	723	3.2	37	2.3	208	3.6
Dams and irrigation	224	1.0	10	0.6	39	0.7
Electrical power	1,722	7.6	77	4.8	463	8.3
Railways, etc.	1,463	6.5	133	8.3	335	6.0
Gas and oil	1,140	5.1	24	1.5	95	1.7
Marine construction	332	1.5	102	6.4	89	1.6
Other engineering	777	3.5	66	4.1	184	3.3

Type[b]	Ontario		Prairies		British Columbia	
	Value	Percentage	Value	Percentage	Value	Percentage
Total value	7,947	100.0	4,855	100.0	2,528	100.0
Total building	5,332	67.1	2,651	54.6	1,342	53.1
Residential	2,519	31.7	1,151	23.7	629	24.9
Industrial	962	12.1	238	4.9	217	8.6
Commercial	890	11.2	529	10.9	195	7.7
Institutional	588	7.4	301	6.2	207	8.2
Other	373	4.7	432	8.9	94	3.7
Total engineering	2,615	32.9	2,204	45.4	1,186	46.9
Roads, etc.	723	9.1	490	10.1	283	11.2
Waterworks, etc.	254	3.2	160	3.3	63	2.5
Dams and irrigation	24	0.3	63	1.3	83	3.3
Electrical power	675	8.5	199	4.1	313	12.4
Railways, etc.	445	5.6	379	7.8	199	6.7
Gas and oil	159	2.0	728	15.0	126	5.0
Marine construction	72	0.9	10	0.2	58	2.3
Other engineering	262	3.3	175	3.6	88	3.5

a As a result of rounding, the sum of the parts may not be precisely equal to the whole.

b Because of changes in classification of some types of construction, especially industrial, commercial and other building construction, roads, etc., railroad and other engineering construction, adjustments were necessary to bring the totals for these categories into agreement with totals in other tables based on the revised classifications. These adjustments amounted to from 3% to 5% of the value of the component type of construction and were distributed among the provinces according to the existing distribution of the value for that type of construction.

c Includes Newfoundland.

SOURCE: Computed from D.B.S., *Construction in Canada*, various issues.

Table 17

CONSTRUCTION CONTRACTS AWARDED IN CANADA AND THE PROVINCES, 1946-55[a]

Value (millions of dollars)

Province	Residential	Business	Industrial	Engineering	Total
Canada	5,587.0	4,649.8	2,042.2	4,172.0	16,451.0
Maritimes[b]	192.5	345.5	76.0	352.4	966.2
Quebec	1,662.0	1,335.7	509.1	926.4	4,433.2
Ontario	2,526.3	1,755.4	925.5	1,498.7	6,705.9
Manitoba	258.8	220.2	55.9	201.8	736.4
Saskatchewan	127.3	150.1	24.2	143.9	445.6
Alberta	468.6	447.7	208.0	354.3	1,478.6
British Columbia	351.4	395.4	243.5	694.4	1,684.4

Percentage Distribution

Province	Residential	Business	Industrial	Engineering	Total
Canada	34.0	28.3	12.4	25.4	100
Maritimes[b]	19.9	35.7	7.9	36.5	100
Quebec	37.5	30.1	11.5	20.9	100
Ontario	37.8	26.2	13.8	22.3	100
Manitoba	35.1	29.9	7.6	27.4	100
Saskatchewan	28.6	33.7	5.4	32.3	100
Alberta	31.7	30.3	14.1	24.0	100
British Columbia	21.0	23.5	14.5	41.2	100

a As a result of rounding, the sum of the parts may not be precisely equal to the total.

b Newfoundland included with Maritimes 1950-55; not included before 1950.

SOURCE: Based on data on value of contracts awarded, *MacLean Building Guide*, various issues.

Table 18

PUBLIC AND PRIVATE CONSTRUCTION AS A PERCENTAGE OF TOTAL, NEW, AND REPAIR CONSTRUCTION, 1926-56

Year	Total construction		New		Repair	
	Private	Public	Private	Public	Private	Public
1956 (est.)	63.1	36.9	64.2	35.8	58.1	41.9
1955	65.7	34.3	66.7	33.3	61.4	38.6
1954	64.8	35.2	66.3	33.7	59.5	40.5
1953	64.4	35.6	64.9	35.1	62.4	37.6
1952	61.8	38.2	61.5	38.5	63.1	36.9
1951	64.3	35.7	64.8	35.2	62.7	37.3
1950	64.9	35.1	65.4	34.6	63.6	36.4
1949[a]	65.2	34.8	64.8	35.2	66.2	33.8
1948	67.5	32.5	67.8	32.2	66.6	33.4
1947	69.6	30.4	71.5	28.5	65.0	35.0
1946	67.5	32.5	69.3	30.7	63.6	36.4
1945	68.3	31.7	69.1	30.9	67.3	32.7
1944	60.8	39.2	56.1	43.9	67.9	32.1
1943	47.6	52.4	38.1	61.9	70.0	30.0
1942	55.7	44.3	49.7	50.3	71.2	28.8
1941	58.9	41.1	56.2	43.8	65.9	34.1
1940	63.0	36.9	62.7	37.3	64.1	35.9
1939	63.4	36.6	66.3	33.7	58.3	41.7
1938	61.2	38.8	63.4	36.6	57.6	42.4
1937	62.9	37.1	64.2	35.8	60.3	39.7
1936	65.1	34.9	67.2	32.8	60.8	39.2
1935	60.6	39.4	62.0	38.0	58.4	41.6
1934	60.2	39.8	62.1	37.9	57.7	42.3
1933	60.9	39.1	61.6	38.4	60.1	39.9
1932	57.2	42.8	58.0	42.0	55.9	44.1
1931	58.6	41.4	60.8	39.2	53.3	46.7
1930	61.1	38.9	62.4	37.6	57.3	42.7
1929	67.3	32.7	70.0	30.0	58.8	41.2
1928	69.1	30.9	72.5	27.5	60.1	39.9
1927	69.1	30.9	72.5	27.5	61.0	39.0
1926	70.5	29.5	74.1	25.9	62.6	37.4

a Newfoundland not included before 1949.

SOURCE: Computed from data in Department of Trade and Commerce, *Private and Public Investment in Canada, 1926-1951*, and *Outlook*, various issues. Expenditures on resource development and conservation have been excluded.

Table 19

TOTAL AND NEW CONSTRUCTION BY PRIVATE AND PUBLIC SECTOR, 1951-55

Sector	Total construction			New construction		
	Value (millions of dollars)	Percentages Group	Over-all	Value (millions of dollars)	Percentages Group	Over-all
Total private and public[a]	22,455	100.0	100.0	17,616	100.0	100.0
Private construction	14,438	64.3	—	11,448	65.0	—
Public construction	8,017	35.7	—	6,168	35.0	—
Public construction	8,017	100.0	35.7	6,168	100.0	35.0
Federal	2,544	31.7	11.3	1,797	29.1	10.2
Provincial	3,017	37.6	13.4	2,417	39.2	13.7
Municipal	2,456	30.6	11.0	1,955	31.7	11.1
Federal public construction	2,544	100.0	11.3	1,797	100.0	10.2
Government enterprises[b]	774	30.4	3.4	252	14.0	1.4
Government operated institutions[c]	186	7.3	0.8	180	10.0	1.1
Government departments	1,585	62.3	7.1	1,365	76.0	7.7

a Difference between this total and total construction for 1951-55, as given in other tables in this chapter, is due to revision of data which increases the total by $53 million. As the distribution between private and public components has not yet been made available, no attempt has been made to incorporate the revised figures into this table.

b These categories cover, in general, government-owned establishments whose principal source of funds is derived from the provision of goods and services to the public.

c This includes only federal government housing.

SOURCE: Department of Trade and Commerce, *Private and Public Investment in Canada, Outlook*, various issues.

Table 20

DISTRIBUTION OF PUBLIC CONSTRUCTION IN CANADA, BY NEW AND REPAIR WORK, 1951-55

(values in millions of dollars)

Level of government	Owned enterprises[a]		Operated institutions and housing[b]		Government departments		Total	
	Value	Percentage	Value	Percentage	Value	Percentage	Value	Percentage
New construction by all governments	1,648	26.7	1,012	16.4	3,508	56.9	6,168	100.0
Federal	252	4.1	180	2.9	1,365	22.1	1,797	29.1
Provincial	1,042	16.9	151	2.4	1,223	19.8	2,417	39.2
Municipal	354	5.7	681	11.0	920	14.9	1,955	31.7
Repair construction by all governments	720	38.9	108	5.8	1,022	55.2	1,849	100.0
Federal	524	28.3	6	0.3	219	11.8	749	40.5
Provincial	100	5.4	28	1.5	471	25.5	599	32.4
Municipal	96	5.2	74	4.0	332	17.9	502	27.1

a Cover, in general, government owned establishments whose principal source of funds is derived from the provision of goods and services to the public.

b Includes only federal government housing, provincial hospitals, schools and universities, and municipal hospitals and schools.

SOURCE: Computed from data in Department of Trade and Commerce, *Private and Public Investment in Canada, Outlook*, various issues. Percentages do not add to exact totals as a result of rounding.

Table 21

CONSTRUCTION EXPENDITURES BY DEPARTMENTS OF THE FEDERAL GOVERNMENT, FISCAL YEARS 1952-55

(thousands of dollars)

Federal department[a]	Total value	New	Repair
National Defence	900,941	797,284	103,657
Public Works	263,378	227,151	36,227
Defence Production	160,834	160,834	—
Transport	105,824	98,383	7,441
Agriculture	46,230	40,359	5,871
National Research Council and Atomic Energy Control Board	21,244	20,138	1,106
Citizenship and Immigration	19,584	15,435	4,149
Veterans' Affairs	18,086	15,233	2,853
Northern Affairs and National Resources	16,469	13,756	2,713
National Harbours Board	12,376	12,376	—
Royal Canadian Mounted Police	9,889	9,111	778

a Departments spending $10,000 or more on construction during the period.

SOURCE: *Public Accounts of Canada; Proceedings of the Standing Committee on Finance*, June 20, 1951, pp. 292-294; *Estimates*. Computations and tabulations made from these sources and supplied by courtesy of the Canadian Tax Foundation, Toronto.

Table 22

VALUE OF WORK PERFORMED FOR GOVERNMENT DEPARTMENTS BY OWN LABOUR FORCE, 1951-55

(millions of dollars)

Year	Value of work performed	Value of work performed by own labour force	Percentage of work performed by own labour force
1955	1,025	361	35.2
1954	955	384	40.2
1953	933	318	34.1
1952	939	306	32.6
1951[a]	729	328	45.0
1951-55[b]	4,582[c]	1,697	37.0

a The quality of the estimates for 1951 is uncertain.

b Totals may not be the exact sum of the components, due to rounding.

c The difference of $32 million between this figure and that which may be derived from Table 20 by adding up the value of new and repair construction expenditures by all government departments results from discrepancies (particularly for the years 1952 and 1954) between the data given in *Construction in Canada* and that given in *Private and Public Investment*. The discrepancies are due to rounding and minor revisions.

SOURCE: D.B.S., *Construction in Canada*, various issues.

TOTAL VALUE OF CONSTRUCTION EXPENDITURES IN CANADA BY PRINCIPAL TYPES OF INDUSTRY OR SECTOR, 1951-55

(values in millions of dollars)

Sector	Building		Engineering		Total	
	Value	Percentage	Value	Percentage	Value	Percentage
Total[a]	13,821.2	100.0	8,687.1	100.0	22,508.3	100.0
Housing	6,501.9	47.0	—	—	6,501.9	28.9
Government departments	1,376.0	10.0	3,205.8	36.9	4,581.7	20.4
Utilities	397.2	2.9	3,990.3	45.9	4,387.5	19.5
Manufacturing	1,590.9	11.5	447.5	5.2	2,038.4	9.1
Institutional services	1,538.4	11.0	21.3	0.2	1,559.7	6.9
Trade — wholesale and retail	919.9	6.7	57.9	0.7	977.8	4.3
Mining, quarrying and oil wells	196.0	1.4	692.0	8.0	888.0	3.9
Agriculture and fishing	632.0	4.6	87.3	1.0	719.4	3.2
Finance, insurance and real estate	329.0	2.4	34.5	0.4	363.5	1.6
Commercial services	221.7	1.6	2.9	—	224.5	1.0
Forestry	64.9	0.5	145.1	1.7	211.0	0.9
Construction	53.1	0.4	2.4	—	55.5	0.2

a As a result of rounding the sum of the parts may not add up exactly to the total.

SOURCE: Computed from data in D.B.S., *Construction in Canada*, various issues.

Table 24

SHARE OF CONSTRUCTION WORK PERFORMED BY THE CONSTRUCTION INDUSTRY AND OTHERS, 1951-55

Construction Industry

Year	Value of Construction Work Performed			Percentage of All Construction[a]		
	New	Repair	Total	New	Repair	Total
	(millions of dollars)					
1955	3,598	409	4,007	84.2	40.4	75.8
1954	3,011	371	3,382	81.3	36.3	71.6
1953	2,996	363	3,359	81.7	37.3	72.4
1952	2,641	386	3,027	80.5	42.1	72.2
1951	2,007	484	2,490	73.4	52.2	68.0
1951-55	14,253	2,013	16,265	80.7	41.5	72.3

Others[b]

1955	676	603	1,279	15.8	59.6	24.2
1954	689	652	1,341	18.6	63.7	28.4
1953	670	611	1,281	18.2	62.7	27.6
1952	641	530	1,171	19.5	57.9	27.9
1951	727	444	1,171	26.6	47.8	32.0
1951-55	3,403	2,840	6,243	19.3	58.5	27.7

a New construction in (a) and (b) is related to total new construction, repair construction in (a) and (b) to total repair construction, and so on.

b Represents work done by the labour forces of utilities, manufacturing, mining and logging firms and government departments, home-owner builders and other persons or firms not primarily engaged in the construction industry.

SOURCE: D.B.S., *Construction in Canada*, various issues.

SHARE OF CONSTRUCTION EXPENDITURES REPRESENTED BY OWN LABOUR FORCE OF GOVERNMENTS, UTILITIES AND OTHERS OUTSIDE THE CONSTRUCTION INDUSTRY, 1951-55

(millions of dollars)

Year	Government Departments			Utilities			Others[a]		
	Construction expenditures	Work done by own labour		Construction expenditures	Work done by own labour		Construction expenditures[b]	Work done by own labour[c]	
		value	percentage		value	percentage		value	percentage
1955	1,025	361	35.2	858	518	60.4	3,388	400	11.8
1954	955	384	40.2	872	538	61.7	2,885	421	14.6
1953	933	318	34.1	960	540	56.3	2,733	423	15.5
1952	939	306	32.6	958	500	52.2	2,294	366	15.9
1951	729	328	45.0	740	539	72.8	2,183	304	13.9
1951-55[d]	4,582	1,697	37.0	4,388	2,635	60.1	13,484	1,913	14.2

a Excluding the construction industry.

b Total construction expenditures in Canada less construction expenditures by governments, utilities and the construction industry.

c Represents work done by manufacturing, mining and logging firms, using their own labour, by home owner-builders, and by other persons or firms (other than utilities and governments), not primarily engaged in the construction industry.

d As a result of rounding, the sum of parts may not be precisely equal to the whole.

SOURCE: D.B.S., *Construction in Canada*, various issues.

Table 26

VALUE OF NEW RESIDENTIAL CONSTRUCTION, NEW NON-RESIDENTIAL CONSTRUCTION, TOTAL NEW CONSTRUCTION AND TOTAL CAPITAL INVESTMENT, 1926-55

(values in millions of dollars)

Year	New Residential Construction		New Non-Residential Construction		Total New Construction		Total Capital Investment[a]
	Value	Percentage of total capital investment	Value	Percentage of total capital investment	Value	Percentage of total capital investment	Value
1955	1,496	24.0	2,777	44.6	4,273	68.6	6,230
1954	1,178	21.0	2,502	44.5	3,680	65.6	5,620
1953	1,084	18.6	2,581	44.2	3,665	62.7	5,841
1952	826	15.6	2,437	46.1	3,263	61.7	5,285
1951	821	17.9	1,914	41.8	2,735	59.8	4,577
1950	845	22.1	1,521	39.9	2,366	62.0	3,815
1949[b]	776	22.2	1,326	37.9	2,102	60.0	3,502
1948	668	21.0	1,190	37.5	1,858	58.5	3,175
1947	540	21.7	872	35.0	1,412	56.7	2,489
1946	413	24.3	645	37.9	1,058	62.2	1,703
1945	286	22.3	414	32.2	700	54.5	1,284
1944	237	18.1	442	33.8	679	51.9	1,309
1943	204	13.7	686	46.2	890	59.9	1,485
1942	223	14.5	678	44.0	901	58.5	1,542
1941	244	16.7	559	38.2	803	54.9	1,463
1940	200	19.1	379	36.1	579	55.2	1,048
1939	185	24.2	295	38.5	480	62.7	765
1938	159	20.6	308	39.8	467	60.4	773
1937	175	21.1	344	41.5	519	62.7	828
1936	139	23.6	248	42.0	387	65.6	590
1935	114	22.6	223	44.2	337	66.8	505

VALUE OF NEW RESIDENTIAL CONSTRUCTION, NEW NON-RESIDENTIAL CONSTRUCTION, TOTAL NEW CONSTRUCTION AND TOTAL CAPITAL INVESTMENT, 1926-55

(values in millions of dollars)

Year	New Residential Construction		New Non-Residential Construction		Total New Construction		Total Capital Investment[a]
	Value	Percentage of total capital investment	Value	Percentage of total capital investment	Value	Percentage of total capital investment	Value
1934	98	23.6	184	44.2	282	67.8	416
1933	76	23.2	153	46.8	229	70.0	327
1932	96	19.6	230	46.8	326	66.4	491
1931	168	19.1	424	48.1	592	67.2	881
1930	204	15.9	581	45.1	785	61.0	1,287
1929	247	16.3	646	42.6	893	58.8	1,518
1928	236	18.2	547	42.2	783	60.4	1,296
1927	217	20.0	416	38.3	633	58.2	1,087
1926	212	23.1	332	36.2	544	59.3	917
1946–55	8,647	20.5	17,765	42.1	26,412	62.5	42,237
1926–55	12,367	19.9	25,854	41.7	38,221	61.6	62,049

a Expenditures on new construction, new machinery and equipment.

b Newfoundland not included before 1949.

SOURCE: Department of Trade and Commerce, *Private and Public Investment in Canada*, various issues. Data for value of new non-residential construction have been adjusted to exclude expenditures for resource development and conservation.

Table 27

NEW CONSTRUCTION, CAPITAL EXPENDITURES AND GROSS NATIONAL PRODUCT IN CANADA,[a] SELECTED YEARS, 1926-55

Year	New Construction		Capital Expenditures (construction, machinery and equipment)		Gross National Product
	Total value (millions of dollars)	As percentage of G.N.P.	Total value (millions of dollars)	As percentage of G.N.P.	Total value (millions of dollars)
1955	4,273	16.0	6,230	23.3	26,769
1954	3,680	15.1	5,620	23.1	24,317
1953	3,665	15.0	5,841	23.9	24,473
1952	3,263	14.0	5,285	22.7	23,255
1951	2,735	12.7	4,577	21.3	21,474
1950	2,366	13.0	3,815	21.0	18,203
1949[a]	2,102	12.8	3,502	21.3	16,462
1948	1,858	11.9	3,175	20.3	15,613
1947	1,412	10.3	2,489	18.1	13,768
1946	1,058	8.8	1,703	14.2	12,026
1945	700	5.9	1,284	10.8	11,850
1939	480	8.4	765	13.4	5,707
1938	467	8.9	773	14.8	5,233
1937	519	9.7	828	15.5	5,355
1936	387	8.2	590	12.6	4,701
1930	785	14.2	1,287	23.2	5,546
1929	893	14.5	1,518	24.6	6,166
1928	783	12.8	1,296	21.2	6,105
1927	633	11.2	1,087	19.2	5,647
1926	544	10.3	917	17.3	5,294

a Newfoundland not included before 1949.

SOURCE: Data for new construction and for capital expenditures are from Department of Trade and Commerce, *Private and Public Investment in Canada*, various issues. Data for value of new construction have been adjusted to exclude expenditures for resource development and conservation. Data for Gross National Product are from D.B.S., *National Accounts: Income and Expenditures*, various issues.

Table 28

NET VALUE OF MANUFACTURING PRODUCTION AND NET VALUE OF CONSTRUCTION IN CANADA AND ANNUAL PERCENTAGE INCREASE, 1946-53

(*millions of dollars*)

Year	Manufacturing Production		Construction	
	Net value	Percentage increase over preceding year	Net value[a]	Percentage increase over preceding year
1953	7,993.1	+ 7.4	2,454.0	+24.1
1952	7,443.5	+ 7.2	1,976.7	+13.7
1951	6,940.9	+16.8	1,738.3	+17.9
1950	5,942.1	+11.5	1,475.0	+ 7.6
1949[b]	5,330.6	+ 7.9	1,371.0	+ 7.1
1948	4,938.8	+15.3	1,280.0	+32.5
1947	4,282.1	+23.5	966.0	+27.9
1946	3,467.0		755.0	

a Total value of construction expenditures (new and repair) less cost of materials used. This is considered to be a better measure of construction output than the gross figures on construction expenditures which have been used in the other tables.

b Newfoundland not included before 1949.

SOURCE Computed from data in D.B.S., *Survey of Production*, various issues.

Table 29

NET NATIONAL INCOME FOR CONSTRUCTION INDUSTRY AND FOR ALL INDUSTRIES, 1926-55

(millions of dollars)

Year	Construction Industry		All industries (value)
	Value	Percentage of total national income	
1955	1,444	7.0	20,738
1954	1,235	6.6	18,808
1953	1,234	6.4	19,133
1952	1,025	5.6	18,326
1951	856	5.0	17,138
1950	809	5.6	14,550
1949[a]	776	5.9	13,194
1948	684	5.4	12,560
1947	572	5.2	10,985
1946	430	4.4	9,821
1945	340	3.5	9,840
1944	283	2.9	9,826
1943	329	3.6	9,043
1942	297	3.6	8,337
1941	254	3.9	6,563
1940	178	3.4	5,263
1939	148	3.4	4,373
1938	145	3.6	4,018
1937	147	3.6	4,062
1936	113	3.2	3,487
1935	95	3.0	3,188
1934	76	2.6	2,897
1933	69	2.8	2,452
1932	107	4.1	2,630
1931	196	5.9	3,333
1930	241	5.6	4,283
1929	290	6.1	4,789
1928	242	5.0	4,823
1927	208	4.7	4,417
1926	201	4.8	4,185

a Newfoundland not included before 1949.

SOURCE: Data on construction income and total national income are from D.B.S., *National Accounts: Income and Expenditure*, various issues.

NATIONAL INCOME, BY INDUSTRY, 1954 AND 1955

(values in millions of dollars)

Industry	1954		1955	
	Value	Percentage	Value	Percentage
Business:				
Agriculture	1,368	7.3	1,627	7.8
Forestry	366	1.9	398	1.9
Fishing and trapping	60	0.3	64	0.3
Mining, quarrying and oil wells	644	3.4	792	3.8
Manufacturing	5,426	28.8	5,957	28.7
Construction	1,235	6.6	1,444	7.0
Transportation	1,178	6.3	1,293	6.2
Storage	51	0.3	59	0.3
Communication	362	1.9	397	1.9
Public utility operation	446	2.4	468	2.3
Trade				
Wholesale	913	4.9	997	4.8
Retail	1,717	9.1	1,851	8.9
Finance, insurance and real estate	1,682	8.9	1,826	8.8
Service	1,615	8.6	1,684	8.1
Government	2,021	10.7	2,198	10.6
Non-residents	–276	–1.5	–317	–1.5
Total	18,808	100.0	20,738	100.0

SOURCE: D.B.S., *National Accounts: Income and Expenditure, 1950-1955*, p. 31.

Table 31

DISTRIBUTION OF NET NATIONAL INCOME IN THE CONSTRUCTION INDUSTRY, 1950-55

(millions of dollars)

Components	1950	1951	1952	1953	1954	1955
Wages, salaries and supplementary labour income	581	639	768	865	842	957
Corporation profits before taxes	52	46	66	97	90	113
Investment income excluding corporation profits	5	7	8	8	11	
Net income of unincorporated business	171	164	183	264	292	374
Total	809	856	1,025	1,234	1,235	1,444

SOURCE: D.B.S., *National Accounts: Income and Expenditure, 1950-1955*, pp. 31-33.

Table 32

SELECTED INDICATORS OF GROWTH IN CANADA, 1946-55[a]

(millions of dollars)

Indicators	1955	1954	1953	1952	1951
Gross National Product	26,769	24,317	24,473	23,255	21,474
Capital investment	6,230	5,620	5,841	5,285	4,577
Value of construction	5,288	4,694	4,637	4,175	3,661
Value of new construction[b]	4,273	3,680	3,665	3,263	2,735
Residential construction	1,496	1,178	1,084	826	821
Non-residential construction	2,777	2,502	2,581	2,437	1,914
Public construction	1,422	1,241	1,285	1,258	962
Private construction	2,851	2,439	2,380	2,005	1,773

	1950	1949[c]	1948	1947	1946
Gross National Product	18,203	16,462	15,613	13,768	12,026
Capital investment	3,815	3,502	3,175	2,489	1,703
Value of construction	3,132	2,817	2,537	1,992	1,580
Value of new construction[b]	2,366	2,102	1,858	1,412	1,058
Residential construction	845	776	668	540	413
Non-residential construction	1,521	1,326	1,190	872	645
Public construction	820	740	598	402	325
Private construction	1,546	1,362	1,260	1,010	733

a Data for most recent years are subject to revision.

b Excludes expenditures for resource development and conservation.

c Newfoundland not included before 1949.

SOURCE: D.B.S., *National Accounts: Income and Expenditure*, various issues; Department of Trade and Commerce, *Private and Public Investment in Canada*, various issues.

POPULATION AND HOUSING CONSTRUCTION, CANADA, UNITED KINGDOM AND UNITED STATES, 1947-55

Year	Midyear Population (millions)				Dwellings Completed				Dwellings Started			
	Canada[a]		United Kingdom	United States	Total		Per 1,000 population		Non-farm[d]		Per 1,000 non-farm population	
					Canada[b]	United Kingdom[c]	Canada	United Kingdom	Canada	United States	Canada	United States
	Total	Non-farm	Total	Non-farm	(thousands)				(thousands)			
1955.....	15.6	13.1	51.0	142.4	132	324	8.5	6.4	134	1,329	10.2	9.3
1954.....	15.2	12.6	50.8	139.9	106	354	7.0	7.0	110	1,220	8.7	8.7
1953.....	14.8	12.2	50.6	136.3	101	327	6.8	6.5	100	1,104	8.2	8.1
1952.....	14.4	11.7	50.4	132.1	76	248	5.3	4.9	78	1,127	6.7	8.5
1951.....	14.0	11.2	50.3	129.5	85	202	6.1	4.0	64	1,091	5.7	8.4
1950.....	13.7	10.9	50.3	126.1	92	205	6.7	4.1	89	1,396	8.2	11.1
1949.....	13.4	10.2	50.4	120.0	92	220	6.8	4.4	86	1,019	8.4	8.5
1948.....	12.8	9.4	49.9	118.0	81	292	6.3	5.9	85	931	9.0	7.9
1947.....	12.6	9.1	49.4	116.0	79	245	6.3	5.0	72	853	7.9	7.4

a Excluding Newfoundland, Yukon and Northwest Territories.

b Includes conversions.

c Includes substantially war-damaged houses repaired, conversions and adaptations, and new accommodation in service camps.

d Covers dwellings in new structures and excludes conversions and temporary units.

SOURCE: Canadian data: Central Mortgage and Housing Corporation, *Canadian Housing Statistics*, various issues.

United Kingdom data: Central Statistical Office, *Monthly Digest of Statistics*, March, 1956; 1950 total dwellings were computed from the monthly average in United Nations *Monthly Bulletin of Statistics*, April, 1956; and O. J. Firestone, *Residential Real Estate in Canada*, p. 74.

United States data: Department of Labor, *Construction Review*, March, 1956, and O. J. Firestone, *op. cit.* Population data for United States are from United States Department of Commerce and United States Department of Agriculture, *Farm Population*, Series Census — AMS (P-27), No. 21. Population data for Canada and the United Kingdom are from United Nations, *Monthly Bulletin of Statistics*, April, 1956. Non-farm population data for Canada for 1951 are from Table 15, Vol. 1, *Census of Canada, 1951*. For the other years farm population was derived by inflating the figures for agricultural workers (as given by The Labour Force Survey of D.B.S.) according to the ratio prevailing in 1951 between agricultural workers and total farm population (as given by the 1951 Census). These estimates of farm population were then deducted from the available estimates for total population to get the above figures for non-farm population.

2

NATURE AND STRUCTURE OF THE CANADIAN CONSTRUCTION INDUSTRY

The Nature of Construction Activity

Construction activity has many unusual features which sharply distinguish it from other forms of production. It is unique in producing goods which cannot be transferred from one place to another. Therefore construction activity cannot be concentrated in any small area — although there is some concentration of construction firms — but must be as dispersed as the needs which arise for it. It is this geographical aspect which sharply differentiates construction from manufacturing. In manufacturing, the plant and the workers remain where they are while the product moves. In contrast it is the product of construction which remains a permanent feature of the landscape while the plant and workers move. In another sense construction is very similar to agriculture. It is carried on everywhere by a multitude of small units and is affected by the weather in a like manner.

Definition of Construction

Construction has been broadly defined as "the creation of any structure or the alteration of the natural topography of the ground, plus the maintenance and repair of such products". A definition once used by the Dominion Bureau of Statistics says construction "embraces all new buildings and works, together with alterations, additions, conversions, maintenance and repairs effected to existing ones. It includes works relating to engineering and marine projects as well as to structures of all types; of betterments, maintenance, etc., of steam and electric railway companies; and the actual installation of machinery, excluding, of course, the cost of machinery which is to be installed."

A shorter statement now used by D.B.S. more simply states that "new construction is comprised of all new work put in place, additions and major renovations, conversions and alterations where either a structural change takes place or the life of the structure is extended. Repair construction includes minor renovations and alterations". However, for statistical purposes all work exceeding $2,000 in value is classified as new construction.

These definitions indicate that the term construction can include a wide range of activities and "products". D.B.S. in a classified index of construction activity lists 135 forms of construction activity, although not all of them are

mutually exclusive because of the use of different terms to describe similar activity. A detailed classification of construction work performed in Canada in recent years lists 71 distinct types of structures and works.

The Construction Industry

All the various types of construction activity defined above are carried on by a heterogeneous group of builders and operators. These may be split roughly and simply into two groups: persons and firms primarily engaged in what might be termed the construction industry, and persons and firms not primarily part of the construction industry. The work performed by the first group is termed by D.B.S. "contract construction", and that done by the second group, "other construction". There is no unambiguous, clear-cut dividing line between the two, but construction work performed by those not considered to be part of the construction industry "represents work done by the labour forces of utilities, manufacturing, mining or logging firms and government departments, home owner-builders and other persons or firms not primarily engaged in the construction industry".

An indication has already been given in Chapter 1 of the relative importance of the construction work performed by the group not considered to be part of the construction industry. The rest of this study will be concerned with the activities of persons and firms who make up the construction industry proper.

The construction industry is sometimes defined so as to include more than the units engaging directly in construction activity. Independent professional services are provided by architects and engineers (civil, structural and mechanical) for many types of construction activity, and accordingly many would include these architects and engineers in any definition of the industry. Then there are the vast number of supply firms producing building products and related items primarily for use in construction. These are sometimes considered to form part of the construction industry. There may also be some "outside" organizations and firms providing essential services for the construction industry and these too may at times be properly considered part of the industry. In Canada an example of an outside organization serving the construction industry is the Building Division of the National Research Council. Very properly, the people in this organization feel they are a part of the industry although narrower industry definitions would exclude them.

However, for purposes of our analysis the construction industry proper will be narrowly defined to include only those groups actually engaged in construction activity on a full-time and independent basis. This would include all construction units operating for their own account or under contract from some outside source. It would exclude construction units forming part of a larger organization and engaged mainly in construction operations for that organization. Some mention of the role of architects and engineers

will be made in the next chapter on the functioning of the industry, and developments in building products will be covered in later chapters.

The Standard Industrial Classification Manual of D.B.S. recognizes two major groups in the construction industry: general contractors and special trade contractors. The first group includes "general contractors engaged in the construction of buildings and highways, heavy construction, marine construction and miscellaneous constructions". This group is further subdivided into three categories, according to type of work, namely: buildings and structures; highways, bridges and street construction; and other construction.

The buildings and structures sub-group includes general contractors "primarily engaged in the construction of buildings such as houses; farm buildings; industrial and commercial buildings including stores; public buildings; and building alterations and repairs by general contractors. Speculative building by general contractors . . . as well as building by operative or speculative builders operating on their own account" are also included in this sub-group. The highways, bridges and street construction sub-group includes "general contractors primarily engaged in the construction of highways, grade separations, streets, waterworks, gas mains, sewers and sewage disposal, bridges and viaducts". The "other construction" sub-group, as defined by D.B.S., is made up of general contractors primarily engaged in the construction of such projects as hydro-electric plants, transmission lines, telephone lines, power canals, dams, dikes, harbours and canals (including dredging), docks and piers, other marine construction, airports, radio towers, railway right-of-way and structures and other construction projects not elsewhere classified.

Special trade contractors, or sub-contractors, include all those operators who do only part of the work usually covered by a contract taken by a general contractor, as well as all those doing jobbing trade work directly for owners. The Dominion Bureau of Statistics lists separately ten different major trades and mentions ten more in a miscellaneous category. The ten major trades listed by the Bureau are: bricklaying; carpentry work; concreting and cement work; electrical work; lathing, plastering and stucco; painting and decorating; plumbing, heating and air conditioning; roofing (except sheet metal roofing); sheet metal work (including sheet metal roofing); and tiling, marble and terrazzo.

There are many more varieties of special trade contractors representing all the various divisions of labour which can be effected in this highly complex industry. There are separate trade contractors for almost all specialized construction operations. Thus, the trade directory of the Toronto Builders Exchange classifies about 100 different categories of trade contractors while the membership list of the Builders' Exchange in Montreal, using broader categories, classifies almost 50 different types of trade contractors. The tender form used by the Department of Public Works of Canada lists 73 separate trades of which at least 63 are usually performed by sub-con-

tractors. These are not all of equal importance, however, and the more important ones number about 27. The average public works' project usually requires about 25 different sub-contractors. In 1950, of the total value of construction work performed in Canada by sub-contractors, 18 trades accounted for all but about 4% of the work. In that year, the last for which the information is available, the total value of work sub-contracted was $316.5 million and all but $11.9 million was performed by 18 trades. Of these, ten reported value of work in excess of $10 million.

The General Contractor

The general contractor may do either light or heavy construction work, or both. Although there are some contractors who operate in both fields, most contractors tend to concentrate on one or the other type of construction. Light construction usually refers to building construction, residential and non-residential, and heavy construction refers to engineering construction other than road building, which is handled by a special class of contractors.

Some organizations in the industry look upon the general contractor as an operator who does at least concrete, masonry, and carpentry work with his own labour force so that only a portion of the job he contracts for is sub-contracted. (There may be operators who do no construction work themselves but sub-contract everything, but such operators are not considered to be general contractors by those in the industry.) The main functions of the general contractor are to organize and carry out his own work and to organize and co-ordinate the work of the sub-contractors on the job.

For these functions the general contractor requires, on a permanent basis, an office staff of clerks, bookkeepers, and estimators, and an outside staff of superintendents and foremen. He also requires skilled labour in the carpentry, bricklaying, and rodmen trades. While he may try to retain these as part of his permanent labour force his ability to do so depends on the volume of work he has on hand.

A certain amount of equipment is also necessary but the amount actually possessed is related more to the length of time the general contractor has been in business than to anything else. As the time a general contractor has been in business lengthens, the stock of equipment on hand grows. Indeed, some of the larger and older companies have acquired so much equipment that they have set up separate companies to handle it. These auxiliary companies not only supply equipment to their parent company, but also operate a rental agency for other equipment users. Whether a particular piece of equipment is rented or bought outright depends mainly on the length of time it will be used. The equipment rental rate varies greatly depending on the type of equipment. In the Canadian Construction Association's Rental Guide, the monthly rates vary from a low of 4% to a high of 19% of current replacement values, but most of them seem to be under 10%.

The amount of construction work a general contractor does on a job and the amount he sub-contracts depends on many considerations. For one thing, the extent of sub-contracting varies with the type of construction activity. It is most extensive in building construction and least in engineering construction. One large general contracting firm which engages in all classes of construction work reported that on heavy construction projects it sub-contracted only about 5% of the work although for commercial and institutional buildings it sub-contracted as much as 80%. Other contracting firms interviewed also stated that sub-contracting was negligible in most heavy construction work.

Once the general contractor is awarded a contract for a particular project he is free to decide on the amount of work that will be sub-contracted. Within limits the portions sub-contracted depend on the relative advantage to the general contractor. However, the range of building trades is now so extensive that most general contractors confine their attention to a few trades common to most building projects. Most general contractors do the masonry, carpentry, and concrete work, because such work if not properly controlled would cause considerable disruption. Some contractors will also do excavation and foundation work while others will give it out to sub-contractors.

Some general construction firms are moving toward more integrated operations and undertaking some operations normally sub-contracted — such as plastering, painting and decorating — using permanent employees retained for this purpose. However, one general contracting firm in the Toronto area which does some of its own trade work reported in an interview that there are only a few construction firms in the Toronto area who do not sublet all the trades. The very specialized trades, such as plumbing, heating, ventilating, and electrical work, are usually sublet. For instance, it is very rare for general contracting firms to do any plumbing trade work themselves. It was suggested to the writers that there are perhaps fewer than three general contracting firms in Canada who do this. Other trades, such as painting, roofing, lathing and plastering, are generally sublet although some general contracting firms may carry out these latter operations on their own if necessary.

The availability of reliable and experienced sub-contractors sometimes has a bearing on the amount of work sub-contracted. Where reliable sub-trades are not available or where prices do not appear right some general contractors may employ directly the necessary skilled and licensed men in all of the trades required. But apparently this is not done very often.

Other things being equal, a greater combination of trades within a general contracting organization would not necessarily be more economical for overhead would be higher and additional surpervision would be required. Fluctuations in the flow of work also make it less attractive to have a larger

plant and permanent labour force. Specialized sub-contractors who have a small group of skilled workers can often do a job for less than a general contractor working with a larger group. In sub-contracting the element of proprietary interest is much greater, which tends to promote quality and efficiency. Also, since the sub-contractor provides his own capital and equipment, the financing problem of the general contractor is thereby eased.

General contractors engaged in building work can vary the amount of work sub-contracted only by handling a larger proportion of the operations themselves. As already noted most of them have not the facilities for doing much of the trade work. Furthermore, even those general contractors normally able to do a large part of the work with their own labour force will find at times that the volume of work on hand requires them to sublet. In short, most general contractors engaged in building work have little scope for altering the proportion of work sub-contracted on a particular job.

Road Builders

Contractors engaged in the construction of roads, streets, airports, and other associated works are usually differentiated from general contractors and referred to as road builders. This is because road building is a highly specialized activity in which only a few general contractors participate. Road builders have their own provincial and regional associations, the foremost one of which is The Ontario Road Builders' Association. Of the contractor membership of this association less than 4% of the members are also general contractors.

Although there is some sub-contracting in road building work it is not nearly as extensive as in building construction, because the number of different and distinct operations is much less. It is considered desirable for the road builder to do at least 50% of the work on a project leaving no more than 50% for sub-contractors. Much of the sub-contracting is for hauling and grading, with hauling sub-contracting providing substantial business for the small-truck industry.

Specialization in road building work, unlike building construction, takes place among the contractors themselves rather than among the sub-contractors as such. Road builders specialize in various types of highway construction, such as grading, black-topping, culverts, etc. Of course, such specialization often enables the road builder to act as a sub-contractor on various jobs. For example, if a road builder has a lot of grading equipment not being used he will often act as a sub-contractor to keep his equipment working full-time.

Road building is now in the machine age and road-builders require such expensive equipment as bulldozers, tractors, graders, asphalt machinery and compressors. Most of the equipment is owned rather than rented, but there is some renting among road builders and from equipment dealers.

The labour requirements of road builders are definitely for casual or temporary workers as the Canadian climate imposes a clearly defined seasonal operating period—from April to November—on road building work.

Speculative Construction

Road builders and general contractors carry out construction work under contract for others and their work is therefore referred to as contract construction, although this term is also used in a wider sense to include all work performed by the industry, whether on a contract basis or not. Most of the construction work put in place by the industry is probably of the nature of contract construction in the narrower sense. However, there are operators in the industry who initiate work themselves. These operators work on a speculative basis, carrying out construction work on their own account with a view to selling the final product to some buyer contacted after the work has been conceived or initiated. "Operative builder" or "merchant builder" are terms applied to units which operate in this fashion.

Operative builders may also do some work on a contract basis, while some general contractors may do speculative construction.

Most speculative building takes the form of housing but may also include such building projects as store blocks, apartments and office buildings (up to 40,000 sq. ft.). Operators who build houses and apartments are usually a completely different group from the general contractors who do the larger commercial, monumental, and engineering works. Large general contracting firms have not gone in for housing projects to any extent because of the speculative nature of such projects. Although they could contract for a speculative builder many of them are hesitant to do so because housing represents a different type of construction from that which they are set up and staffed to do. As a result, industry participation in residential construction is left mainly to merchant builders who operate chiefly, but not wholly, on a speculative basis. Of course, such residential construction is also carried on by home-owner builders and other classes of builders who are not an integral part of the construction industry proper.

Merchant builders in the construction industry operate much the same way as general contractors except that they initiate most of their own work, building on their own land. They, too, make substantial use of sub-contractors, generally employing on their own account no other tradesmen than carpenters.

Trade- or Sub-Contractors

There are two broad classes of trade- or sub-contractors. There are those small trade-contracting firms who only do jobbing work — i.e., repair

and remodelling work. Then there are the larger older firms who contract to do new construction work as sub-contractors. However, many firms do both jobbing and sub-contract work. In the plumbing and heating trade, for example, the proportion of shops doing only jobbing work is well under 25% in most areas, while the proportion which do both contracting and jobbing work is approximately 75% in Quebec and Ontario, and between 80% and 90% in British Columbia. In Nova Scotia and New Brunswick nearly all plumbing shops do both contracting and jobbing work.

Of the many different kinds of trade contractors in existence and noted earlier, only two operate under licensing arrangements: the plumbing and the electrical trades. Sanitation and fire regulations are the principle reasons for licensing these trades. Information on licensing is at hand for the plumbing trades only. The licensing procedures and regulations under which this trade operates vary from locality to locality. In most provinces there are municipal and provincial codes and licensing arrangements. The province of Quebec has a unique regulation which requires plumbing and heating contractors (as well as electricians) to be members of a corporation. In three provinces — Newfoundland, Prince Edward Island, and Nova Scotia — there are only municipal regulations. Licence fees vary by area from $1 to $200.

Although the multiplicity of licensing regulations probably does not restrict the areas in which firms operate or limit their numbers, it does nevertheless prove an inconvenience to qualified tradesmen who must prove their qualifications whenever they move and come into contact with different licensing requirements. From this point of view standard licensing procedures under provincial statute would seem to be desirable.

Number of Firms in the Construction Industry

There is no over-all figure on the number of construction firms in Canada, nor has a total count ever been made, because of the difficulty of recording the large number of small units in the industry and of identifying the units that should be counted. However, without getting involved in the question of what constitutes a construction firm, we will attempt to use what information is available to give some indication of the approximate number of firms in the industry. In doing this, the following working definition of a construction firm is adopted: any individual, group of individuals, or corporate body, who, as their main activity, operate as independent entrepreneurs in carrying on some construction operation, either with their own labour or the labour of employees, or both.

Information obtained by correspondence from each of the provincial Workmen's Compensation Boards on the number of construction firms registered with each Board yielded a total of 38,277 firms. This figure of 38,277 is only a very rough approximation of the number of construc-

tion firms in Canada. It requires adjustment for differences in the dating of the various provincial figures, possibly varying industry classifications among the provinces, for the exclusion of firms with less than a stated number of employees, and for firms registered in more than one province. Despite all the limitations, however, the Workmen's Compensation aggregate figure of approximately 38,000 is a useful indication of the number of *employing* firms in the construction industry.

In addition to employing firms, or firms with employees, there are a large number of own-account proprietors in the construction industry. At the time of the 1951 census, there were in all 63,475 construction proprietors. This total includes both partners and sole proprietors and there is no indication in the census as to the division between the two. However, taxation statistics for 1952 suggest that about 27% of all business proprietors filing income tax returns were partners.

This percentage might be applied to the census total of construction proprietors to obtain a rough estimate of the number of construction partners. But this figure in turn has to be corrected for the average number of partners per firm in order to arrive at the number of construction partnerships. The minimum number of partners per firm is, of course, two; but the maximum number does not seem to be much more. One informant close to the industry claims that it is not common practice for a construction partnership to consist of anything in excess of three partners, and as a rule when a firm reaches this number of partners it applies for a charter. It, therefore, seemed reasonable to apply the factor of two and one-half to our estimate of the number of partners in the construction industry to get at the number of partnership firms in the industry.

The results of the above arithmetic were: 46,400 sole proprietor construction units (both own-account and employing) and 6,800 partnership firms. To these must be added the 2,250 construction corporations in existence in 1951. The grand total is 55,450 as the number of all construction firms in Canada in 1951 (including both employing and own-account units).

Growth in the Number of Construction Firms

It is common knowledge that there has been a considerable expansion in the number of construction firms in Canada since 1945, but existing data do not permit any exact measure of this expansion. Census data on the number of employers and own-account proprietors in the construction industry suggest that the number of construction firms almost doubled between 1941 and 1951.

Other evidence tends to confirm this rate of expansion. Annual data are available from 1944 on, covering the number of incorporated construction companies in Canada. Table 1 gives these figures for construction firms, and for other types of firms, for the years 1944 to 1953 (the latest year for which this information is at present available). Expansion

Table 1

NUMBER OF ACTIVE TAXABLE COMPANIES[a] BY INDUSTRIAL DIVISION, IN CANADA

1944-53

Industrial Division	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	Change between 1944 and 1953
Agriculture, forestry and fishing	571	630	727	808	808	813	862	956	1,045	1,056	+ 485
Mining, quarrying and oil wells	910	1,128	1,359	1,581	1,420	1,260	1,146	1,212	1,460	1,701	+ 791
Manufacturing	7,176	7,735	8,592	9,462	9,806	10,046	10,651	11,056	11,310	12,570	+ 5,394
Construction	809	908	1,068	1,323	1,508	1,725	1,987	2,250	2,474	3,530	+ 2,721
Transportation, storage, communication and public utilities	1,396	1,466	1,644	1,853	1,970	2,005	2,140	2,273	2,410	2,703	+ 1,307
Wholesale trade	3,402	3,672	4,301	5,150	5,544	5,946	6,687	7,240	7,617	7,863	+ 4,461
Retail trade	4,171	4,501	5,026	5,629	6,266	6,723	7,371	8,036	8,521	9,084	+ 4,913
Finance, insurance and real estate	4,004	4,099	4,340	4,528	4,509	4,707	5,071	5,450	5,699	6,336	+ 2,332
Service	2,776	2,987	3,283	3,671	4,055	4,218	4,601	4,831	5,179	4,872	+ 2,096
Unclassified	92	103	102	82	74	24	29	61	62	30	− 62
Total	25,307	27,229	30,442	34,087	35,960	37,467	40,545	43,365	45,777	49,745	+ 24,438

a Excludes active taxable co-operative companies.

SOURCE: Department of National Revenue, Taxation Division: *Taxation Statistics*, various annual issues.

in the number of incorporated construction firms over that period raised the 1953 figure to more than four times the 1944 figure. Based on 1946 the expansion was three and a half times. No other class of corporation increased so rapidly over these years. The total number of corporations in Canada barely doubled between 1944 and 1953 and from 1946 only increased by a little more than 50%.

Part of the very large increase in the number of construction corporations over the postwar years is due to a large increase which occurred in 1953, but even if we eliminate 1953 and use the period 1946 to 1952 we find that the number of construction corporations still more than doubled. These corporation data, however, are an imperfect measure of the rate of growth in the number of construction firms because they cannot be adjusted for the incorporation of firms already existing in some non-corporate form. There is much scope for incorporation in the construction field because of the large number of unincorporated units, and the tendency in the last few years has been for unincorporated units to seek incorporation.

Another measure of the growth in the number of construction firms in Canada is provided by information related to the employment series tabulated by D.B.S. According to these data there were, in 1943, 1,513 construction establishments having, as a rule, 15 or more employees. By 1948 this number had increased to 2,300 and by 1954 to 3,200. These figures show a more than twofold expansion over a 12-year period, although this may partly reflect an expansion in larger firms rather than an increase in new firms.

On the basis of these various imperfect measures, it seems reasonable to conclude that the number of construction firms has at least doubled over the postwar years. In absolute terms the number of new firms entering the industry, and remaining in business, over the postwar years has probably not been less than 10,000.

Distribution of Canadian Construction Firms, by Category and Location

There are no data for showing what categories of construction firms have increased the most and even the data for showing the distribution of firms by type of work are very sketchy. For 1953 we have for the first time a breakdown of incorporated construction firms by type of business. The breakdown is available, in *Taxation Statistics, 1955,* for 3,530 construction corporations in Canada. Of these corporations 1,995 are general contracting firms and 1,535 are trade-contracting firms. This latter figure is broken down as follows:

Plumbing and heating firms	590
Electrical contracting firms	289
Other trade-contracting firms	656

Among the 1,995 general contracting firms are 1,473 firms in the building and structure sector of the industry, 396 road builder corporations, and 126 classified as other general contracting firms. Thus, among incorporated construction firms the most numerous type is the general contracting firm engaged in work on buildings and structures.

Unfortunately there are no data on the number of unincorporated construction firms by type of business and the distribution indicated by the corporation data may not be representative of the total industry distribution. However, there is an estimate for the total number of plumbing and heating contracting firms in Canada, which is useful for indicating the extent of incorporation in this particular field of construction. There are approximately 3,700 plumbing contracting firms so that in addition to about 600 incorporated plumbing and heating contracting firms there are about 3,100 unincorporated ones.

A distribution by sector of work of all contracting establishments in Canada, in the main employing 15 or more employees, was made available for this study, by courtesy of the employment section of D.B.S. The establishment figures were refined for our purposes to exclude establishments not considered by us to be a part of the construction industry. Of 2,580 such construction establishments at August 1, 1955, 2,157 were in the building sector, 301 in the highways, bridges, and street sector, and 122 in the engineering sector. The obvious conclusion which these figures support is that the vast majority of contracting firms (both general and trade) are engaged in building as opposed to engineering and road-building work. The distribution of employers and own-account workers in the construction industry shown by the 1951 census was as follows: buildings and structures, 59,993; highways, bridges, street construction, 939; other construction, 274; all other trades, 2,239; not stated, 32.

The distribution of construction firms across Canada is about what would be expected. On the basis of data obtained from the various Workmen's Compensation Boards about two-thirds of all construction firms are located in the two central provinces of Quebec and Ontario. Outside of these two provinces British Columbia seems to have the next largest number of construction firms although two of the Prairie Provinces are not far behind. Most of the construction firms in Quebec and Ontario seem to be located around Montreal and Toronto. One estimate puts the number of contracting firms in Montreal at over 7,000. If there is a similar number of construction firms in Toronto then over one-quarter of all the construction firms in Canada would be located in these two cities. And, as might be expected, there is likewise a concentration of the larger construction firms in these cities and their provinces. Census data on construction employment show that about two-thirds of all workers in the industry are located in Quebec and Ontario.

Entries, Disappearances and Competition in the Construction Industry

In many fields of construction it is relatively easy for an individual to set himself up as an entrepreneur. This is particularly true for small-unit residential building and for lighter types of non-residential building; but, of course, much less so for engineering construction and large-unit building. Entry is easiest where speculative projects are possible. When construction work is dependent on winning a contract the new firm must naturally be able to underbid established firms. Even then the buyer may prefer to award the contract to a higher bidding but established firm rather than deal with a new firm.

A new trade-contracting firm often arises as a result of a skilled labourer in that trade deciding to go into business for himself. He will start as an individual, or partnership, in a small way, probably doing only jobbing work and perhaps eventually moving into sub-contract or new construction work. For example, new plumbing shops in the construction industry usually arise as a result of journeymen getting masters' licences and going into business. Other trade shops, at least in the more common trades, probably originate in much the same way. In the house-building sector of the industry many new firms are created by entrepreneurs who rise from the ranks of the skilled employees of other builders. In the non-residential building sector new firms are often started by engineers and superintendents who, having obtained experience working for other construction firms, go into business for themselves. Very little is required in the way of financial capital and outside financing to go into business as a general contractor.

It takes a little more to enter the industry as a road builder. It is generally considered that to start up as a road builder one would need as a minimum about $5,000 in cash and about the same amount in bank accommodation. However, road-building firms have begun operations with much less, especially when the owners operate the road-building equipment themselves. One spokesman in the field cited the case of two partners who started business with $500 and equipment bought on the rental-purchase plan. In less than a year they had 40% equity in their machinery and had increased their quick assets to over $4,000. But this was an exceptional case in the road-building field.

New construction firms in Canada also arise as a result of established non-resident firms taking on jobs in this country. To do this, they usually send some key personnel from their head office, open up a branch office and obtain a contract. Specialist firms, i.e., firms engaged in lines of construction requiring special techniques and skills, and firms with an international reputation, usually do not have much difficulty in getting established here. Foreign firms, not well known in Canada, have much

greater difficulty and may have to bid well below Canadian firms in order to get a contract for work in Canada. Some of them, after setting up subsidiaries in Canada find they have to withdraw. There has been a growing tendency in the last few years for British and American firms to tender for construction work in Canada. Most of these firms, when they obtain a contract, establish a Canadian company. However, non-resident participation in the Canadian industry appears to be relatively small, although official statistics on this are not available. It has been estimated that about 40 large contracting companies controlled or owned by non-residents have developed in Canada since 1945. Some of these 40 firms represent new firms started in Canada by non-residents; the rest arose from purchase of controlling interests in established Canadian concerns. A few American and British firms have established new house-building firms in Canada, and British and American firms have also entered the engineering construction field lately.

Nevertheless, foreign direct investment in the Canadian construction industry is, as noted above, relatively insignificant. An interesting article on foreign investment in Canadian construction states that there has been a "recent entry of several American companies in Canada's construction and engineering business. Some of these firms moved north to do specific jobs about six years ago; when the projects were completed, they decided to stay and are now actively engaged, along with domestic and newly arrived British engineering firms, in building everything from apartment houses to sections of the Seaway. Other large United States engineering concerns have bought control of well-known Canadian competitors."[1]

New firms sometimes arise through mergers but this is not too common in the Canadian construction industry. Though permanent mergers are rare, temporary mergers — several companies joining together under a new name to bid on a large project — are relatively numerous and are becoming increasingly prevalent. Such temporary mergers are known as "joint-ventures". They are formed among two or more firms to pool equipment, finances, and trained supervisors to handle large projects, such as the St. Lawrence Seaway and the Toronto subway, requiring resources beyond any individual contractor's capacity to provide. To handle such jobs, the highly specialized facilities of two or more large contracting firms are combined for the purpose. The advantage of such an arrangement is that it enables a contractor to lessen his risk on large contracts by pooling his resources of plant and organization with other contractors of similar size and experience. The mechanics of joint-venture operations

[1] James Montagnes in *Barrons*, November 28, 1955, p. 18.

appear to vary, but, in general, one company heads up a contract and all participating firms estimate for a phase of the work. The work is then divided among the contractors in the venture according to their capacity. Sometimes there is merely a contract among the firms involved; at other times a partnership is formed; and at still other times, a separate subsidiary is established.

New firms in the Canadian construction industry appear to have a short life, so that the average age of firms in the industry is quite low. Many general contracting firms seem to last about one generation and then disappear. However, some of the larger firms which become public stock companies tend to continue in business, and there are a few firms who have been in business 50 years or more, but these are exceptions. Many of the building firms in residential construction are young. Of 1,700 builders operating under the National Housing Act in 1955, mainly in speculative building, about half had been in business less than five years, according to a survey made by Central Mortgage and Housing Corporation. Road-building firms, at least in Ontario, tend to be older and the average age of such firms is estimated at approximately 20 years.

No information is at hand on the age of trade-contracting firms other than for the plumbing field. In that trade the average age of the well-established shop seems to be over 15 years, with the plumbing shops in central Canada having a somewhat higher average age than such shops in other parts of Canada. The low average age for firms in the construction industry is of course partly a reflection of the rapid increase in the number of such firms in the last 10 years.

Since it is comparatively easy for individuals with little capital to establish a firm in the construction industry, it is to be expected that there will be a fair number of firms disappearing as a result of bankruptcies. The number of bankruptcies in construction has been rising steadily since 1946, partially reflecting the growth in the number of firms in the industry. The number of business failures in construction, as reported by Dun and Bradstreet, from 1946 through 1955 totalled 1,053 as compared to a total of 7,652 for all business failures in Canada. Thus, construction failures in Canada in that period accounted for about 14% of all Canadian business failures. In the United States, construction failures accounted for about 10.5% of all American business failures in the years 1946 to 1954. The number of construction failures in Canada has exceeded 100 every year since 1950. The figures in the following table show that the average number of yearly failures in construction, based on 1949 to 1954, accounted for about 13% of all business

failures. However, in 1955 the percentage of construction failures to the total rose to over 17%.

Table 2

NUMBER OF CANADIAN BUSINESS FAILURES FOR CONSTRUCTION AND ALL INDUSTRIES, 1949-54 AND 1955

Category	1949–54 average	1955
All industries	896	1,352
Total construction	119	233
General contractors	51	115
Carpenters and builders	7	10
Building sub-contractors	58	103
Other contractors	3	5

SOURCE: Computed from data in Dun and Bradstreet of Canada Limited: *Five Important Releases on Canadian Business Failures*, June 11, 1956.

Sub-contractors do not appear to be any more prone to failures than do general contractors, judging by the above figures, although it might be expected that failures would be heavier among sub-contractors as they tend to be smaller and have less financial backing than general contractors.

Another set of figures on bankruptcies is compiled by D.B.S. from failures under the provisions of the Bankruptcy and Winding Up Acts. Table 3 summarizes these figures for the last five years.

Table 3

COMMERCIAL FAILURES IN CANADA, AS REPORTED BY THE DOMINION BUREAU OF STATISTICS, 1950-55

Type of Business	1955	1954	1953	1952	1951	1950	1950–55 average
Trade	878	973	650	569	570	502	690
Manufacturing	306	416	359	305	269	257	319
Service	452	408	286	279	255	273	325
Construction	285	135	124	114	126	97	147
Transportation and utilities	119	67	52	45	42	40	61
Finance	43	41	30	32	27	20	32
Miscellaneous	363	238	156	165	110	114	191
Total	2,446	2,278	1,657	1,509	1,399	1,303	1,765

SOURCE: D.B.S., *Commercial Failures Under the Provisions of the Bankruptcy and Winding Up Acts*, various annual issues.

These figures support the general conclusions arrived at from the Dun and Bradstreet figures, except that they show a more favourable bankruptcy rate for construction. Over the last five years construction bankruptcies accounted, on a yearly average, for only 8.3% of all failures under the Bankruptcy and Winding Up Act. For 1955 the corresponding percentage was 11.7.

Most often cited as reason for bankruptcy in construction is inexperience, as would be expected from the comparative ease of entry to this field. Also following from this ease of entry as a cause of failure is inadequate capital. Reasons for bankruptcy more peculiar to the industry are over-extension, i.e., carrying too many jobs at once, and bidding too low for jobs. Both stem from the nature of competition in the industry.

The make-up of the industry naturally invites and generates a great deal of competition — at least for the vast portion of work to be done. Firms have to bid on a sufficiently large number of projects to ensure obtaining an adequate flow of work and with so many new firms entering the industry bidding tends to be close and very competitive. In years of less than "boom" proportions competition in this industry takes the form of very close bidding. Several spokesmen in the industry have reported that in the last few years competition has been heavy with bidding becoming very keen and the number of bidders on jobs increasing greatly.

Five or six tenders per job is considered sufficient by the Canadian Construction Association to ensure adequate competition, but the number of bidders per job has usually been in excess of this number. In the Montreal area the number of bidders per job has been varying from five to 20. In 1955 the number of tenders received per project by the Dominion Department of Public Works averaged 6.1. However, because of the very high level of activity prevailing in 1956 the average number of tenders received per project during the first part of this year has dropped to 3.84.

Nevertheless, excessive tendering has become a problem which could become more serious for the industry. It is wasteful and tends, in the long run, to raise costs. Excessive tendering seems especially wasteful in engineering construction. It is claimed that engineering tenders sometimes cost as much as $100,000 to prepare and require the use of skilled engineering talent. Excessive tendering is of course partly the fault of owners who invite too many contractors to bid on the same contract and partly the fault of construction firms who tender on every conceivable project.

Low bidding, the other principal manifestation of intense competition in construction, like excessive tendering carries its own, if drastic, corrective, i.e., losses and bankruptcy. Low bidding is blamed mainly on the many new firms in the industry who often find it necessary to take their first few jobs at a loss in order to obtain work and establish a repu-

tation. Some interesting illustrations on the spread between bids now developing in the industry were given by Clifford Fowke in *The Financial Post,* of May 19, 1956, and are quoted here :

> "A grading contract: Successful bid was $1.7 million. Three others were within 17% of it, two were 47% and 53% above it.
>
> "A building contract: Lowest bids were $100,000, $109,000, $123,000 . . .
>
> "A $5 million government job: There was a difference of $500,000 or 10% between the bids of the first and second low bidders.
>
> "A sub-trade contract: Bids varied from $500,000 to a high of $962,000."

Such practices only bring serious economic consequences if they drive efficient and reputable firms out of existence by making the industry an unprofitable one, and we have uncovered no evidence of this at the present time.

It has been claimed that the industry is not particularly profitable. Indeed, it has been said by those speaking for the industry that the average percentage of profit is very low considering the service rendered and the risk taken. By contrast, another spokesman, close to the industry but not directly engaged in it, claims that profits in the construction industry compare very favourably with other industries. There are few data available to indicate how construction profits compare with profits in other industries. To show that the construction industry is not particularly profitable taxation data have been quoted at times to the effect that in recent years about one-quarter of all Canadian construction corporations filing income tax returns report an annual loss. Thus, in 1953 (latest year these figures are available at present) of 3,530 active taxable construction corporations, 857 reported a loss. However, taxation statistics show that among active taxable companies in 1953 there was a higher proportion of companies in the construction industry reporting a profit than in any other industry listed. Thus, 75.7% of companies in construction showed a profit in 1953. The corresponding figures for other industries were wholesale trade, 72.5%; manufacturing, 72.4%; retail trade, 71.7%; public utilities and finance, insurance and real estate, 70.9%; service, 67.8%; transportation, storage and communication, 66.5%; agriculture, forestry and fishing, 54.3%; unclassified, 13.3%.

Also, according to D.B.S. data, corporation profits of construction firms almost doubled between 1950 and 1954. In the same period profits of manufacturing corporations declined 15% and profits of all corporations declined by more than 5%. Net income of unincorporated construction firms, between 1950 and 1955, more than doubled while that of unincorporated manufacturing firms declined 18% and net income of all unincorporated businesses rose little more than 7%. In 1953 (the

only year the following calculations can be made for yet business proprietors in the construction industry filing individual income tax returns had an average earned-income of a little less than $4,000 compared to a little more than $4,000 in manufacturing and to about $3,500 for all business proprietors. Since the capital investment of construction proprietors is certainly no greater (and is probably less) than that of manufacturing or all business proprietors, the above figures are a fair indication that construction profits are, in a relative sense, as high as, or higher than, profits of unincorporated firms in manufacturing, and in all lines of business.

If competition is not having a serious effect on construction profits it may be having disturbing consequences for the internal structure of the industry. The structural distortion which may result from competition stems from the fact that usually small construction firms cannot bid for the same jobs as larger firms, but that large firms can do the same jobs as the smaller ones. Thus, when competition for the larger jobs becomes more intense the tendency is for some of the larger firms to crowd into the field usually occupied by small firms. Competition is likely more intense on small projects than on large ones and the tendency of competition to move downward maintains this relationship. An exception to the rule that competition is more intense on small jobs arises in the road-building field in Ontario. It is estimated that the average number of bidders per road-building project in Ontario for contracts of $500,000 or more is double the number of bidders for contracts valued up to $150,000. The downward-moving tendency of competition in Canadian construction is partly due to the entry of foreign firms in the field. These firms tend to be large and to specialize in big projects, and their competition probably works to exclude some Canadian construction firms from the larger jobs.

The solution to this might be for Canadian companies to bid for a share of construction work in other countries. With one or two notable exceptions Canadian bidding for jobs outside the country has been very limited although opportunities for doing so are reported to be increasing. In the last few years some Canadian contractors have opened branch offices in the United States or have participated in Columbo Plan projects abroad.

Another form of " outside " competition faced by the industry arises from the construction activity carried on by individuals and organizations not in the industry, which as pointed out in Chapter 1 accounts for a considerable proportion of the construction work performed in Canada — 24.2% in 1955. The industry feels that *much* of the construction work performed by owner-builders, farmers, public utilities, governments, and other organizations for their own account could be carried out at less expense and in less time by private contractors employing skilled craftsmen and submitting bids under the competitive tender system.

Operating Area of Construction Firms

How far afield construction firms are prepared to take on work is related to the question of competition. Geography is not too important in limiting competition although it has a bearing on it. Most general contractors do not attempt work on sites very far removed from their own headquarters. Many of them limit themselves to work in their particular metropolitan area working well within a radius of 50 miles from their office. Personal preference, size, and abundance of work are probably the main factors restricting these firms to local areas.

Another, but smaller, group of general contractors does work over a somewhat wider area within their province than purely local firms. To what extent these firms cover their province depends partly on competition from local firms. Travelling and supervisory expense sometimes makes it difficult to compete in an area against firms located there. To supervise work performed within the province some firms find it necessary to establish local offices, so firms taking on contracts outside their home province must be assured of sufficient work to justify establishing a separate office.

Some general contractors do operate over more than one province. Such regional firms will operate over, say, the Maritime Provinces, or may take in all of eastern Canada, while others concentrate their activities in the Prairie Provinces or western Canada. Some of these firms will have more than one main office. Indeed, a separate subsidiary may be formed for each province in which work is performed.

A smaller number of general contracting firms do construction work right across Canada and some of them will do work in the United States, South America, and any other area where contracts can be obtained.

Mobility of the general contractor is mainly a function of the size of the firm, size of the contract, and availability of supervisory ability. As the size of the firm and contract shrink so does the effective operating area of the general contractor. For road builders, a most important factor in limiting their area of work is the ease and economy of shifting heavy equipment about. The overhead cost in moving heavy equipment is a sizable item in all estimates submitted for road-building work.

The cost of taking on work at a greater distance is not a very serious limiting factor to the operations of house builders as the general practice is to hire local labour and make use of local supplies. However, temporary "invasion" of an area by outside builders is considered unethical by the industry and this feeling might tend to reduce, partially, mobility within the residential building sector of the industry. One authority on house building gave his opinion that the maximum radius of operations from his home office for a house builder lies between 75 and 100 miles. Trade contractors tend to be more local in their sphere of operations

than general contractors. In the plumbing trade, the only trade for which information was obtained, possibly only one firm operates on a national scale, although several operate in more than one province and maintain provincial offices.

Size and Domination of Firms in the Industry

As noted above most of the firms in the construction industry in Canada are small, local firms. Employment data for private construction establishments, usually employing 15 or more employees, for August, 1955, were made available for this study by D.B.S. These data show that of 2,580 construction establishments covered on the given date only 36 had 500 or more employees, 442 had 100 or more employees, and 921 had 50 or more employees. Average number of employees per establishment was under 70. These figures, however, overstate the size of construction establishments in terms of employees as they relate only to the larger employing units in the industry. There is a large number of firms with only a few employees and also a large number (15,000 to 20,000) with no employees. Thus, in August, 1955, there were 366,000 paid workers in all construction firms in Canada and of these about 179,000 were employed in the 2,580 large establishments mentioned above. This means that the remaining 187,000, just slightly more than half the total, were employed in more than 30,000 construction firms. The average number of employees for these firms would then be about six compared to more than 70 for the larger firms. The average number employed per firm, taking into account all firms, both employing and own-account, might be about seven.

Information on the size of construction firms, according to size of contracts they tender for, is even more sketchy than it is for employment. A survey of a convenient but small sample of general contractors across the country did reveal a fair number of million-dollar firms — that is, firms who tender for jobs running to more than $1 million. A few of these have tendered for jobs valued at $10 million or more and one firm reported it could handle as much as a $40 million contract. A number of contractors reported their maximum bid as lying between $500 thousand and $1 million and a not uncommon range for maximum bids was $50 thousand to $300 thousand. A spokesman for one large general contracting firm, in reply to a question on size of jobs handled by firms, stated that prior to World War II most construction projects in Canada were relatively small and that jobs of $2 million to $3 million were then considered large. Now these are fairly commonplace and jobs of $8 million to $10 million are not unusual. In 1954 there were, according to information supplied to us by *MacLean Building Guide,* at least 250 contracts awarded, each of which was for $1 million or more.

Between 1949 and 1955 the average value of contracts awarded, or work starts, for business construction rose from $34.9 thousand to $91.4

thousand; for industrial construction, from $79.7 thousand to $320.1 thousand; and for engineering construction, from $145.0 thousand to $210.9 thousand. In the same period the composite index of building materials and construction wage rates rose only 31.6%, or less than the average value of contracts for the various classes of non-residential projects. The average values of contracts awarded for non-residential construction are given in Table 4, showing the figures for 1955 and the ten-year period 1946-55.

Table 4

AVERAGE VALUE OF CONSTRUCTION CONTRACTS AWARDED IN CANADA, 1946-55 AND 1955

(thousands of dollars)

Type of Construction	Value	
	1955	1946–55
Churches	74.9	54.2
Public garages	21.8	15.9
Hospitals	459.2	321.3
Hotels and clubs	120.9	45.9
Office buildings	85.8	54.7
Public buildings	185.1	111.5
Schools	155.9	124.8
Stores	56.4	24.1
Theatres	67.3	55.6
Warehouses	46.0	29.5
Total business	91.4	53.6
Total industrial	320.1	140.4
Bridges	195.6	97.6
Other engineering	211.9	168.9
Total engineering	210.9	163.2

SOURCE: Computed from data in *MacLean Building Guide*, various issues.

Although the average size of construction jobs seems to be fairly small the distribution of work among firms in the industry seems to be heavily skewed. In 1950 the Dominion Bureau of Statistics found that over 17,000 contractors and builders had a normal value of work performed of $50,000 or less. It would appear that small firms do the greatest number of jobs, but that large firms do the greatest amount of work in terms of value. This is the case for general contractors and road builders operating in Ontario. In that province about 80% of the provincial highway work is handled by 80 contractors. In Saskatchewan, for the plumbing trade, it is estimated that 80% of the value of plumbing work is performed by 20% of the shops.

Central Mortgage and Housing Corporation made a survey of 1,700 house builders operating under the National Housing Act in 1955 and found

that 5% of them were responsible for 40% of the total number of houses built by the group, and that 42% of the builders accounted for less than 6.5% of the total dwellings completed. These 1,700 builders completed 36,837 dwelling units in 1955. Of the other 90,000 dwelling units completed in that year 24,000 were in apartment buildings, many of which were built by fairly large builders. The remaining 66,000 dwellings were completed by builders operating on a scale much below the average for the 1,700 builders surveyed. Average number of completions for these 1,700 builders was about 21, although more than half of them completed less than that. In the United States, as well, most of the houses are built by small-scale operators. Around 1949, firms building ten houses a year or less were responsible for approximately 50% of the total production, and about 80% of the houses were built by firms completing fewer than 50 houses a year.

Information on the distribution of work between general contractors and trade-contractors is available only for 1949 and 1950. These data are pesented in Table 5.

Table 5

VALUE OF CONSTRUCTION WORK IN CANADA PERFORMED BY GENERAL CONTRACTORS AND TRADE-CONTRACTORS, 1949 AND 1950

(millions of dollars)

Type of Contractor	1950	1949
General contractors, trade- and sub-contractors	1,619.4	1,348.3
General contractors	887.4	786.1
Trade- and sub-contractors	732.0	562.2
Sub-contractors	316.5	261.1
Independent trade-contractors	415.5	301.1

SOURCE: Compiled from D.B.S., *The Construction Industry in Canada*, issues for 1949 and 1950.

These figures indicate that for those years only about 20% of contract construction was carried out under a sub-contract, that most of the trade work was done on an independent basis, and that general contractors accounted for a larger share of the value of work performed than did trade-contractors. While sub-contractors account for a greater proportion of the work in non-residential building, the general contractor accounts for more in residential construction and the same is true for road building and also possibly for heavy-engineering construction.

From the available evidence on the distribution of work among firms in the industry, there is no indication that any group of firms dominates the industry. Even in the large-job field domination is generally not a problem

as there seem to be enough firms able to bid on large projects to prevent any one or two from having an undue influence. In specialized types of construction — mainly in the engineering sector — one or two firms might dominate, but over the whole field of construction activity no group appears to dominate activity. Indeed the possibilities for small firms to grow are very good and the number of large firms which have developed quite rapidly from small beginnings is impressive.

The optimum size for construction firms does not suggest itself from the material uncovered in the course of this study. However the optimum size may be defined, that size has been increasing since 1946 with the expansion in the size of individual construction projects in Canada. Perhaps the crucial factor in setting limits to the optimum size of the firm is supervision. This is a factor less subject to expansion than other factors of production, which suggests that small-scale firms will generally be more suitable for handling much of the industry's work than large-scale firms. That the industry is composed largely of small-scale units would seem to indicate that the optimum size for most firms comes at a smaller, rather than a larger, volume of work. In house building, a private study indicated that the optimum level of efficiency for the medium-size builder occurred when he built 45 to 50 houses a year. Above this volume there was no gain in efficiency until he reached 180 to 200 houses a year.

No doubt a good many entrepreneurs in the industry feel that with more financial capital, more equipment, and so on, they could operate at a more efficient level — which suggests that, in their opinion, they are operating below their optimum level. Where most of the firms would stand — below, at, or above their optimum level — can only be a matter of opinion in the present state of knowledge, but it is the opinion of this study that the case for larger construction firms in Canada, sometimes advocated, has yet to be proven.

3

FUNCTIONING OF THE INDUSTRY

The Main Components

The first conclusion to be drawn from Chapter 2 is that there is no clearly definable entity that may be termed a construction industry. Much construction activity is carried out by units whose prime occupation is something else — manufacturing, utilities, railroads, mining, farming and commercial business. For purposes of studying the functioning of the industry we have confined ourselves to those whose sole occupation is directly concerned with construction activity. These are the professional designing organizations, general contractors, builders, special trade contractors and workmen.

Architects and Engineers

According to a report on architects prepared by the Department of Labour in June, 1955, there were 1,271 architects, with three years or more experience, practising in Canada. Of these 4% held postgraduate degrees, 68% held bachelor's degrees, and 28% either did not graduate or never attended university. The percentage of architects who are not university graduates is much higher than in other technical professions and compares, for example, with about 11% in mechanical engineering and 5% in civil engineering.

To practise, an architect must be licensed according to the regulations of the professional governing body in the province in which he desires to practise. The qualifications necessary for a licence vary slightly from province to province, but in general the following may be licensed:

1. Any graduate of a recognized university school of architecture, provided the course is at least four years and includes service for at least one year under an approved architect.

2. Any graduate of a provincial school, approved by the provincial association, who has served for a longer period under an approved architect than required of university graduates and passed a qualifying examination.

3. Any person, who has worked for five years as a student with an approved architect and has passed a qualifying examination.

Provincial regulations assist the associations by requiring that the services of an architect be used for certain structures, but the standards vary widely. In Ontario, all construction work costing more than $5,000, with certain obvious exceptions, requires the services of an architect. In other provinces, the amount varies from $10,000 in British Columbia up to $60,000 in Nova Scotia, usually excepting work done on private property for the sole use of the owner.

A classification of architects by specialization is provided by the Department of Labour Survey which shows the proportion of architects engaged in various functions in 1955. Classifying by type of employment, the report states that 67.7% are in consulting work, 13.2% are employed by federal, provincial or municipal governments, 9.1% by companies in such industries as transportation, manufacturing, finance and public utilities, 7.9% by educational institutions and others, and only 2.1% by companies in the construction industry.

The classification of the number of architects by function, as disclosed by the survey mentioned, is as follows:

	Number	Percentage
Building design	740	58.2
Planning	186	14.6
Organization and administration of projects	158	12.4
Supervision of construction	82	6.4
Specifications	16	1.3
Draughting	67	5.3
Purchasing of building materials	6	0.5
Other	16	1.3
Total	1,271	100.0

The complexity of modern building, particularly in the industrial and commercial field, has brought the engineer more and more into the picture as a consultant, planner and designer of structures in addition to his traditional role in such engineering construction as bridges, tunnels, roads and so on. As a result, it is not unusual to find engineers of various special branches of the profession regularly employed in architectural and construction firms. There are also a number of engineering firms which specialize in designing and supervising the construction of industrial plants, pipelines and other technical structures. In the United States such firms have extended their services to include market surveys, cost estimates, etc., to determine the economic feasibility of an industrial project and their reports are frequently used as supporting material in seeking financial backing for the project.

Initiation of Work

The backbone of the industry is, of course, the general contractor, who sometimes acts as a promoter, especially in the housing field, and thus both initiates and executes construction work. However, the great bulk of construction work is not initiated by the producer but by the purchaser or owner.

Of the 61 general contractors, scattered across the country, who were questioned on the subject, only eight reported that they initiated all, or substantially all, the work they performed; and these were evenly divided, as to field of work, between housing and commercial construction, including prefabricated buildings. Eleven others stated they sometimes initiated projects, six of whom were in the housing field, four in commercial and industrial, and one in engineering.

The most common method of initiating work is for the owner to have drawings and specifications prepared by an architect or engineer and on the basis of these to contract with a general contractor who, in turn, may sublet parts of the work to special trade contractors. There can be many variations of this procedure. The contractor sometimes provides architectural and engineering services, or the owner or his architect may dispense with the general contractor and act as a co-ordinator of construction, dealing directly with special trade contractors. Between these extremes various procedures may be used, but in every case the decision is made by the owner.

In general terms the architect's or engineer's function is to translate the requirements of the owner into designs and specifications conforming to accepted standards. He is usually responsible for ensuring that these instructions are carried out by the contractor and, as will be seen in the following discussion of contracts, he is given authority to discharge this responsibility.

The usual method of letting a contract is to call for tenders, which may be either an open invitation to bid published in appropriate newspapers or trade journals or direct invitation to selected contractors. Private construction and some government work (usually provincial or municipal) is sometimes allotted via competitive tenders from selected contractors but in the case of federal government work almost all calls for tenders are public.

Trade papers seem to be the most frequently used channel for obtaining news of tenders, followed by personal and business contacts, newspapers, invitations and repeat business from clients. In the majority of cases where competitive tenders are called for or invited, the contract is awarded to the lowest bidder.

Contracts are generally of two types: fixed price contracts and cost plus fee contracts. A variation is the guaranteed price contract which usually sets the maximum amount to be paid to the contractor with provision for dividing between owner and contractor any savings under the maximum.

Standard forms for the first two types mentioned above for use in Canada have been approved by the Engineering Institute of Canada, the Royal Architectural Institute of Canada and the Canadian Construction Association.

Regulations and procedures governing the awarding of contracts are not standardized. Corporations or individuals naturally are free to use whatever method is best suited to their particular circumstances, but government bodies which are spending public funds are generally subject to some restrictions. These vary widely in degree and are most exacting in the case of federal government contracts. For this reason we feel it is worthwhile to devote the following paragraphs to a summary of the more important features of the federal regulations.

Regulations and Procedures on Government of Canada Contracts

These regulations as they apply to contracts for construction, state that tenders must be invited, except where there is pressing urgency for speed, where the contracting authority can do the work more expeditiously and economically itself or where the value of the work is less than $15,000 and it is deemed not advisable to call tenders.

Where tenders have been obtained, and it does not appear advisable to let the contract to the lowest tenderer, the contracting authority must obtain the approval of the Treasury Board. A contracting authority may enter into a construction contract without the Treasury Board's approval, if the amount of the contract does not exceed $15,000, or if the amount is between $15,000 and $50,000 and not less than two tenders have been obtained. The contracting authority reports monthly to the Treasury Board all contracts where the amount payable exceeds $5,000, which were entered into without the Board's approval.

The amount payable under a construction contract may not be increased without the Treasury Board's approval, except that where the amount was originally less than $15,000 it may be increased to that figure, or by $5,000 if at least two tenders were obtained. Where the amount is between $15,000 and $50,000 and not less than two tenders are obtained, the amount may be increased by up to $5,000. Where Treasury Board approval was obtained originally, the contract may be increased by the lesser of 10% or $15,000.

Every government contracting authority, before entering into a contract, must require the contractor to place a deposit with the government to ensure satisfactory completion. This security must be 10% of the amount of the contract up to $250,000, and 5% of any amount in excess of this. The amount of security deposited may be limited to $100,000 by the contracting authority, and no security is necessary on contracts of less than $5,000. Where the contract provides that the amount payable is to be calculated in relation to costs incurred, security may be of less value, or dispensed with, where the materials, once in place, become the property of the government.

Security may be a certified cheque drawn on a chartered bank or a Quebec savings bank, or Government of Canada bonds or government guaranteed bonds of the Canadian National Railways. If the amount payable under the contract is increased by reason of extras, additions or extensions, the deposit must be increased accordingly. In exceptional cases, the Treasury Board may authorize acceptance of security of a form or amount other than that specified.

When tenders are called for large construction jobs outside of Ottawa, about six weeks are allowed between advertising and the date set for opening of tenders, with a shorter time allowed for work in Ottawa and for marine construction and dredging work. From the tender opening date to the award of the contract, two to three weeks normally elapse where Treasury Board approval is required and less where Department authority is sufficient.

Defence Construction (1951) Limited reports that the average time required from call for tenders to awarding a contract is 70 days and the first progress payment is generally made 30 days after work commences. These times would be longer for cost-plus contracts because of the necessity to arrange a satisfactory basis for calculating payments.

Public tenders are opened officially and publicly by the Secretary of the Department, and local tenders are opened in district offices. A schedule of all tenders complying with the conditions and specifications is prepared and a copy sent to the district office to be checked for inaccuracies. The branch head makes a recommendation to the Deputy Minister who acts in accordance with the regulations outlined before. When a tender has been accepted, if it involves more than $5,000, it is referred to the Chief of Legal Services for drafting of the contract.

Payments under government contracts are made on the basis of progress estimates, subject to a holdback (usually 10%) on each payment which is added to the final payment. When the work is satisfactorily completed the contractor receives the final payment, the holdbacks and the security deposit. The Department of Public Works states that payments on progress estimates normally follow the contractor's draw by one to two weeks.

Government departments generally plan their construction projects on the basis of the government's fiscal year, but no action can be taken until the estimates are approved and tabled in the House of Commons early in the calendar year. Even if contracts under these estimates are awarded in January or February, no payments can be made until the start of the fiscal year on April 1. In spite of this we are informed that government departments try to time the letting of contracts so that outside work will be completed before winter and inside work can be carried on through the slack season.

We were informed by the authorities concerned that government contracts for work in this country are awarded only to firms which have had an office in Canada for at least a year or are directly associated with a Canadian company through a consorting arrangment. In spite of the large volume of construction work done in recent years, there have been very few projects which could not be handled by a large number of qualified firms. Exceptions are technical work on radar defence lines, railroad, power and telephone construction, where only a very few firms have the technical knowledge and skills required

Tender and Contract Forms

These forms constitute the rules of the game under which contractors conduct their business. As such they are of vital importance both to the owner and the contractor and a knowledge of their general terms is essential to an understanding of how the construction industry functions. In the following paragraphs we endeavour to describe briefly the material features of the forms in general use for both government and private construction work.

On a standard government tender the contractor must submit both a total figure for the job and unit prices, the latter to be used to calculate additions to or subtractions from the lump sum for changes in the work. He must also state the country of origin of materials to be used. the work which is to be done directly and the name and address of each sub-contractor together with all work to be performed by each. The deposit which must accompany each tender is forfeited if the tenderer refuses to sign a contract or fails to complete the work after his tender has been accepted. Telegraphic tenders are not accepted.

The standard contract itself is an agreement running to some twelve and a half pages, to be signed and sealed in duplicate. The engineer or architect in charge of the project has final authority in all interpretations of the contract including specifications, workmanship, methods, equipment used, timing, etc., and there is no appeal from his decisions. All materials, tools and equipment placed on the site become the temporary property of the Crown and may not be removed until the contract has been completed to the satisfaction of the engineer. The contractor is responsible for all damage or other claims arising from work under the contract. The contractor may not assign the contract or sublet it (except for normal trade sub-contracts) and the Crown may not be held liable for the payment of any monies due to any sub-contractor. There is a prohibition against Sunday work and against any public ceremonies on the site without the written permission of the Minister of the department concerned.

The contractor must pay for labour, services and materials at least as often as payments are received under the contract and the government has

the right to make payments direct in case of arrears, deducting the amounts from what is due the contractor. The government's statements of such payments may not be questioned by the contractor, but the contractor's books are open for inspection by the engineer and any authorized representative of the engineer. Additional work or materials supplied by the contractor for which prices are not mentioned in the contract will be paid for at prices determined by the engineer on the basis of reasonable cost plus 10%.

The contract calls for progress payments monthly, if practicable, at the rate of 90% of the value of work done according to a certificate of the engineer, with the 10% holdback to be paid within two months after completion of the contract to the satisfaction of the engineer. The contractor may claim for items not included in a progress certificate within 30 days of receipt of the certificate but not later than 60 days after completion of the work which the certificate covers. This obviously assumes that progress certificates are never more than 30 days behind the actual work. The engineer, however, is not bound by the progress certificates and may amend them in making up his final certificate.

In case the funds voted by Parliament for the work are expended before completion the Minister may give the contractor notice to this effect. The contractor may then either suspend work or continue without payment until such time as money is voted. In either case he cannot claim for damage or compensation for the interruption or delayed payment. The Minister may order suspension or delay of the work for any period without additional compensation to the contractor and the contractor must resume work promptly when notified to do so. The onus of discovering beforehand every condition affecting the work and the risks of unknown conditions are entirely on the contractor regardless of the information given by the Crown in calling for tenders.

We examined corresponding provincial government contract forms and found them to be similar in nearly every respect to the federal contract. In Ontario, road contracts call for a holdback of 15%, with the time limit for the final payment three months instead of two. All sub-contracts must be approved in writing by the Department of Highways of Ontario.

The standard form of contract approved for private construction by the Royal Architectural Institute of Canada and the Canadian Construction Association calls for progress payments (the percentage left blank) on the 10th of each month on the architect's certificate of work completed, with the final payment on completion of the entire work and one day after all lien rights have expired. These liens are under provincial law and expiration dates vary from 30 days after substantial completion of the work in Quebec, Manitoba, Prince Edward Island and Newfoundland, to 60 in New Brunswick.

Although the contract is between the owner and the contractor, there are various terms and conditions which are binding upon the architect,

calling upon him to supply any additional drawings required and providing that all drawings and additional instructions given by the architect must be consistent with the contract documents. In addition, if the contractor disagrees with the architect on interpretation of the contract documents, he must act according to the architect's decision but may submit any claims for excess costs or other claims to arbitration in the usual manner — that is, to a nominee of each party and a mutually agreed upon third arbitrator. The owner can require the contractor to furnish a performance bond, the premium to be paid by the contractor if the bond was asked for in writing prior to the receipt of bids, and by the owner if asked for subsequently. Payment for changes in the work are also subject to arbitration if necessary. A provision is also included entitling the contractor to interest on all overdue progress payments at the legal rate in force at the place of building. The "legal rate" in Canada is 5% per annum. The provisions regarding subcontractors are similar to those used in the federal government form.

The tender form approved by the Royal Architectural Institute of Canada and the Canadian Construction Association provides either for a bid bond or a certified cheque as a tender deposit, with the notation that a certified cheque is not recommended for private work. In other respects its terms are similar to those used for government tenders.

The Canadian Construction Association has drawn up and approved a "Code of Good Practice" regarding tenders, sub-contracting and payment for work, which is designed to eliminate abuses and causes of friction between branches of the industry. A copy will be found as an appendix to this chapter. The Association, in collaboration with the Royal Architectural Institute of Canada, has also prepared a "Suggested Guide to Bidding Procedure" which is to be published shortly. This booklet sets out clearly and concisely the rights, duties and responsibilities of the owner, the architect and the contractor in connection with tenders, bidding and the awarding and execution of contracts.

Practical Considerations

The foregoing outlines the general conditions under which public and private construction work is initiated and contracts let. The following will present our findings about some of the practical features, obtained through interviews with representatives of government, contractors and other interested bodies.

When a general contractor has an opportunity to tender for a job, there are several factors which he considers in deciding whether or not to bid. First, of course, is the amount of work he has on hand and, second, the type, size and location of the prospective job. Contractors also seem to be keenly aware of their own limitations in competition, as a common consideration in deciding whether to bid was found to be "who else is bidding", that is, how tough is the competition going to be. The characters and reputations

of the owner, the architect and the engineer concerned also had a bearing on whether a job was worth bidding for, especially among road builders, power and engineering contractors and other specialists. Some of those interviewed also indicated a major factor was whether or not adequate financing was available to enable them to take on the jobs.

With regard to information on which to base a tender, most general contractors questioned said sufficient information was supplied with the call or was made available on request. However, some complained of lack of pre-engineering on highway work; poorly prepared plans by architects and engineers; insufficient information on private calls for tenders; and the fact that federal government specifications are too standardized to apply to all local conditions. One small general contractor, probably after a bad day, stated he never got sufficient information because he was dealing with people who had no clear idea of what they wanted !

We were not at all surprised to find that there is a wide disparity in the ideas of contractors on a "normal" margin of error in estimating on jobs. House builders generally agreed that their estimates were accurate within 5% or less, although one large operator observed that some pretty unpredictable things can happen on large multiple projects and the margin can run to 20%. About a third of the general contractors claimed they could estimate within a margin of 1% or less with the balance of the contractors running from 2% up to 10%. An average figure for those questioned in this category would be about 3%. Road builders, whose contracts are usually on a unit basis, generally anticipate a margin of 5% or less, but one mentioned 10% and another up to 20%. In engineering construction the errors in estimates seem to run from 2% to 5%.

Once a tender has been accepted, the contract usually stipulates the date by which work must be finished. The starting date is generally left to the contractor's discretion but it is, of course, affected by the stipulated completion date. Contractors in all fields are normally in a position to start a job on which they have bid in a matter of days, although material, labour or equipment shortages, weather, or condition of the site, may cause delays.

Although the length of time it takes to complete a contract will naturally vary with the size, nature and complexity of the job, as well as factors beyond the control of the contractor, such as ground conditions, weather, labour and material supplies and so on, we obtained some interesting views from various people in the industry on what may be considered "normal" execution times.

On large housing projects a common practice is to proceed so as to finish most of the houses in the winter. This may result in a period of ten months from start of construction to completion of a house, although ordinarily the time needed to build one house is of the order of two to three

months. On smaller projects, one builder states he averages four months for one 1,100-square-foot unit on a 30 house project, with completions coming one per day through the fifth month. A builder in western Canada estimated normal house construction times of three months for plaster wall and nine weeks for dry-wall construction.

One contractor, who does grading and excavation work as well as general building, works to a rough rule of thumb of one month to complete $30,000 of work on each contract. Another contractor whose field is commercial and light industrial buildings pointed out that the time does not increase in direct proportion to cost, since ground preparation is fairly constant; i.e., a multi-storey building will take less time to erect than one with fewer storeys and the same floor area.

One firm in southern Ontario gave the following estimates:

Small plants	10,000 square feet	five months
Large plants	100,000 square feet	eight months
School	eight rooms	five months
School	25 rooms	15 months

Generally speaking, of course, commercial, industrial and public buildings may take from six months to three years, depending on the size and complexity of design and installations. Road builders and engineering contractors gave no estimates for the obvious reasons that a large part of their work is on a unit basis and each job presents different problems.

Contractors specializing in construction for the oil and gas industries estimated execution times of 30 days for $125,000 worth of work and one year for $2,000,000. In these cases a large part of the contract price is absorbed in pipe and other materials so that the construction content forms a relatively small part of the cost.

In line with the contract terms discussed above, terms of payment seem to be uniformly on a monthly basis on the authority of an engineer's or architect's certificate. The amount held back on each payment is generally 10% and almost never more than 15%. Exceptions are special work, such as roads and special engineering construction. A road builder reported terms of 85% progress payments monthly, 10% after 60 days and the balance one year after completion of the contract. One engineering construction firm reported progress payments of 80% twice monthly. Pursuing the question further, it was found that while payments are generally on a monthly basis, the first payment is usually not received until from 31 to 60 days after commencement of work and in some cases may be delayed as long as three months. This experience was fairly general throughout the industry. Two contractors (general and engineering) reported that there were sometimes delays of up to six months in receiving the first payment under government contracts.

Opinion in the industry appears to be widely divergent on the question of whether speed of construction work has improved over the past 10 or 15 years. Those in the affirmative gave as reasons for improvement: increased off-site construction, mechanization, more winter work, use of new materials, better organization of the job and better co-ordination with the trades and with suppliers. The negative replies, which represented a good 25% of those interviewed in all branches of the industry, claimed that poor labour productivity and shorter hours offset new machinery; that modern buildings are more complicated; and that supply problems offset the time saved by improved methods and materials. That availability of materials does constitute a problem is borne out by the replies to a question about the causes of delays on the job. Of 112 answers given 35 named the weather, 37 materials, 13 labour troubles and 12 changes in plans. Other causes mentioned were weaknesses in supervision (six), unavailability of sub-contractors (five) and equipment breakdowns or shortages (four). The last named were confined to engineering and gas and oil industry construction.

Improvements Suggested by the Industry

Various representatives of the industry have made suggestions, some of which have been carried out, for improving the conditions under which contracts are let and completed.

The Ontario Road Builders' Association submitted a brief to the Ontario Legislature in June, 1954. The most important recommendations were:

1. Tenders to be opened publicly and details of all low bids made available to all bidders.
2. Tender deposits to be a flat 5%.
3. Tenders for spring work to be called in the fall to permit better estimation of conditions.
4. Tenders not to be called until all pre-engineering and estimates have been completed.
5. In order to prevent contractors bidding on jobs to an extent beyond their capacity a system of pre-qualification to be set up.

The last recommendation is said to be standard practice in 39 states of the United States. The system generally involves setting a dollar amount for jobs which a contractor may bid for, based on his assets, credit rating, experience and past record of performance. The Ontario Road Builders' Association made a study of the pre-qualification system in force in Michigan, and concluded that it results in lower costs, more completions on time, lower premiums on performance bonds and fewer contracts defaulted.

For tenders by the sub-trades a bid depository system has been in operation in Toronto since April, 1955. This was introduced at the instigation of the Electrical Contractors Association of Ontario and Ontario Branch of the National Association of Master Plumbers and Heating Contractors as a means of eliminating the "peddling" of sub-contracts between general contractors and trade contractors. The bid depository prevents a general contractor from first obtaining a contract and then shopping around among the sub-contractors in an effort to beat down the cost of the work sublet. It also prevents a sub-contractor from trying to find out a rival's price and then undercutting him. The Ontario Association of Architects and the Ontario General Contractors Association also agreed to use the depository on a trial basis until December 31, 1955, and the time limit has since been extended.

Under the system the Toronto Builders Exchange acts as depository for all bids for sub-contractors, each of whom is required to submit sealed envelopes in duplicate containing bids for each general contractor to whom he wishes to quote, an envelope addressed to the architect containing a list of the general contractors to whom he quoted and a third envelope containing the same information for the depository. The general contractor, before submitting his bid to the architect, picks up his sub-contract tender envelopes and then includes in his tender the names of his sub-contractors and the price carried for each, which must correspond with the tenders deposited. After the general contract has been awarded, the depository opens its envelopes, prepares a list of all tenders in each trade and mails the list to the sub-contractors who bid.

Some large firms and owners, who are regularly letting construction contracts, try to accomplish the same result by requiring the general contractor to list his sub-contracts and prices in his original tender and also by requiring the bidder to use only sub-contractors approved by the owner or architect.

There are bid depository systems in operation in at least six Canadian cities and according to information from industry sources the results are generally satisfactory. However, opinion is not unanimous on the subject. Some general contractors claim the bid depository system compels a general contractor to accept bids from the sub-contractors at the last minute with no chance to discuss the details of the price, time schedule, personnel, etc., and consequently the effect is to freeze costs at a high level. On the other hand, prominent figures among the sub-trades are equally convinced that the system is necessary to prevent the bid peddling and bid shopping mentioned above, making the point that the forcing of unduly low bids on the sub-contractors results in excessive cost cutting and inferior work on the job. To the outsider it is apparent that no system is going to work well without good faith among all the participants.

Financing Methods

Since the contractor, as we have seen, normally undertakes work only after the demand for it has been initiated by the owner or buyer, he obviously does not need to carry a large investment in fixed plant and inventory as does a manufacturer or merchant. In fact, a large part of the heavy equipment used in the industry can be obtained on a rental basis for a specific job, and so represents no investment to the individual contractor; although, of course, it represents a heavy investment by the supplier. Consequently, the financial needs of the average contractor are usually confined to short-term credit, and in almost every case he obtains it from his bank.

If he is tendering on a federal government contract his first requirement is a certified cheque for 10% (or sometimes, on large contracts, 10% of part and 5% on the balance) of his tender price. For this he obtains a "tender loan" from the bank, usually at rates below those charged on ordinary loans. This low rate holds good only for a limited time, generally until the contract is awarded or until the tender cheque is cashed. After that the borrower's regular rate applies. This procedure also applies to tender cheques used for provincial and municipal government jobs and private contracts where tender cheques are demanded. In some municipal jobs a bid bond is accepted in place of the tender cheque and in a large number of private jobs no surety is asked, or performance bond required, of the successful bidder. A reputable contractor should have no trouble obtaining tender loans, bid bonds or performance bonds. However, these deposits, together with slow payments, tend to raise the financing costs on government contracts.

Once awarded the job, the contractor must begin spending money on materials, possibly equipment purchases or rentals, and labour. Here again if his own resources are insufficient he will normally use bank credit. Payment terms for materials are usually 30 days, sometimes 60, and unless discounts are allowed for cash the contractor will wait so that his first payments will coincide with receipt of the first progress payment. Labour, of course, must be paid on a current basis. Since the progress payments are subject to holdbacks in addition to the tender deposit, he will probably find that they do not cover all expenses on the job and he may have an investment of anywhere from 15% to 25% in the project by the time the final payment is received.

We have not included payments to sub-contractors in the foregoing because, to a large extent, contractors pay them in accordance with the terms the owner pays the prime contractor. Thus, in effect, part of the financing of the holdback is passed on to the sub-contractor who must make his own financial arrangements. Where outside financing is required, the sub-contractor will usually borrow from his bank.

The extent to which contractors rely on bank credit is indicated in Table 1, although figures on loans outstanding at any one time are often misleading. If anything, these figures understate the case, as it is reasonable to assume that peak loans to the industry would come in the spring or early summer, rather than in the fall.

The general feeling in the industry seems to be that the system of financing works satisfactorily provided there are no delays or breakdowns

Table 1

CHARTERED BANK LOANS TO CONSTRUCTION CONTRACTORS IN CANADA, 1934-54

(millions of dollars)

As at September 30:		As at October 31:	
1954	200.8[a]	1946	71.7
1953	175.0	1945	47.4
1952	158.7	1944	38.5
1951	151.8	1943	44.0
1950	122.7	1942	45.5
1949	113.3	1941	43.7
1948	103.6	1940	45.3
1947	93.9	1939	40.6
		1938	36.0
		1937	32.1
		1936	23.7
		1935	24.1
		1934	21.8

a Figures for September 30, 1954 are not strictly comparable with those for earlier dates owing to the fact that adjustments are no longer made for items in transit.

SOURCE: Bank of Canada, *Statistical Summary, Financial Supplement 1954*, pp. 36-39, and *Statistical Summary*, December, 1950, pp. 207-208.

in the chain of payments. As mentioned before, there were some complaints of delay in receiving progress payments on federal government contracts, and this, coupled with the fact that the tender cheque is cashed on awarding of the contract, or before, means that the government is obtaining credit from the contractors. There is some validity to this claim and it would seem worthwhile to consider whether the use of bid and performance bonds could not be extended to all construction contracts.

Among contractors in general, the financial problem which seemed most pressing, apart from tender cheques and holdbacks, was the financing of heavy equipment. An operator who has substantial equity in his business can often pay for these purchases in a relatively short time and so may finance part of the cost through bank loans. But the contractor who is chronically short of working capital and requires two or three years to pay for such equipment is usually forced to more expensive borrowing from sales finance companies. Under the Bank Act, the chartered banks cannot take mortgage security on heavy equipment when a loan is made to a contractor. Consequently only those who can provide

other security and repay the loan in a relatively short time have access to bank credit for this purpose.

A number of contractors suggested that the banks should be allowed to take such mortgage security and make loans repayable in up to three years. They obviously felt that the banks would be willing to make such loans at the maximum bank interest rate of 6% as against the much higher rates charged by sales finance companies. Loans to borrowers who have to make use of this type of security are apt to be expensive to administer and it is doubtful if the banks would be enthusiastic lenders at 6% even if credit were not as tight as it is at the time of writing.

The house builder, being virtually the only member of the industry who starts producing his product before he sells it, has different problems. Since he has to find a buyer, he is directly concerned with the supply of long-term financing for his prospective client and usually arranges in advance for mortgages through an insurance company, trust company, or in the case of National Housing Act approved projects, a chartered bank. Once the mortgages are approved, subject to a satisfactory buyer, the builder can go to his bank and arrange for temporary credit pending receipt of progress payments on the mortgage commitment. The volume of house building that has taken place in the past few years under various financing arrangements for the home owner is well illustrated in the tables which follow.

In the decade, 1946 to 1955, 36% of all housing starts and 34% of all completions were financed under the National Housing Acts of 1944 and 1954. (See Table 2.) However, in 1946 and 1947 the proportion of assisted housing was less than one-fifth of all starts and was even less for completions; by 1954 and 1955 almost one-half of all housing units were started and completed with assistance under one of the Housing Acts. The number of loans, number of housing units and the amount involved are given in Table 3 for the years 1935 to 1955. Data by provinces for recent years appear in Table 4. Over the period 1949 to 1955 loans were approved for the construction of approximately 275,389 dwelling units. Ontario accounted for nearly half of all the dwelling units for which aid was approved, increasing her share from about a third in 1949 to over 50% in recent years. Quebec, while receiving the second largest share of approvals over the 1949 to 1955 period, experienced a reverse trend from Ontario due to the provisions of the provincial mortgage rebate legislation.

These financing arrangements appear to have supported about all the residential construction that supplies of labour and material would allow. However, several builders felt that higher lending values on old houses would cause better use to be made of existing housing capacity. The idea is that many older houses could be taken in part payment for a new house, reconditioned by the builder and readily marketed if a mortgage of up to three-quarters of the sale price were obtainable.

NUMBER AND PERCENTAGE OF HOUSING UNITS STARTED AND COMPLETED WITH AND WITHOUT AID UNDER THE HOUSING ACTS, 1935-55[a]

Year	Under the Housing Acts		Other		Under the Housing Acts		Other	
	Number started	Percentage of all starts	Number started	Percentage of all starts	Number completed	Percentage of all completions	Number completed	Percentage of all completions
1955	65,495	47.4	72,781	52.6	58,852	46.1	68,700	53.9
1954	50,373	44.4	63,154	55.6	39,137	38.4	62,828	61.6
1953	39,989	39.0	62,420	61.0	35,506	36.6	61,333	63.3
1952	34,400	41.3	48,846	58.7	20,633	28.2	52,454	71.8
1951	21,439	31.3	47,140	68.7	38,782	47.7	42,528	52.3
1950	43,522	47.0	49,009	53.0	36,400	40.9	52,615	59.1
1949	29,253	32.3	61,256	67.7	29,178	33.1	59,055	66.9
1948	26,235	29.1	63,959	70.9	20,768	27.3	55,329	72.7
1947	10,190	13.7	64,073	86.3	10,970	15.2	61,248	84.8
1946	11,520	17.9	52,835	82.1	4,817	8.0	55,637	92.0
1945	4,737	8.6	50,444	91.4	5,094	11.9	37,394	88.0
1944	1,466	3.5	40,034	96.5	1,637	4.5	34,863	95.5
1943	1,731	4.8	34,369	95.2	1,064	3.3	31,636	96.7
1942	1,120	2.8	38,880	97.2	3,195	7.5	39,605	92.5
1941	4,466	8.7	46,734	91.3	4,573	8.6	48,627	91.4
1940	5,738	10.9	46,862	89.1	6,816	13.9	42,184	86.1
1939	5,947	12.2	42,953	87.8	4,669	9.6	44,131	90.4
1938	3,643	8.3	40,257	91.7	2,313	5.6	39,087	94.4
1937	1,797	4.0	43,303	96.0	2,118	4.5	44,782	95.5
1936	729	1.8	40,271	98.2	570	1.5	37,430	98.5
1935	72	0.2	33,828	99.8	—	—	31,800	100.0
1935–55	363,862	25.9	1,043,408	74.1	327,092	24.6	1,003,266	75.4
1946–55	332,416	36.2	585,473	63.8	295,043	34.0	571,727	66.0

a Excludes conversions, excludes the Yukon and Northwest Territories, and excludes Newfoundland before 1949.

SOURCE: Central Mortgage and Housing Corporation, *10th Annual Report, 1955*, Table I.

Table 3

MORTGAGE LOANS APPROVED UNDER THE HOUSING ACTS, 1935-55[a]

Housing Act and period	Number of loans	Number of housing units	Amount ($000)
Dominion Housing Act, 1935			
1935 (October 1st-December 31st)	73	97	514
1936	550	788	3,778
1937	1,311	1,817	7,524
1938 (January 1st-July 31st)	1,149	2,197	7,803
Sub-total, 1935 to 1938	3,083	4,899	19,619
National Housing Act, 1938			
1938 (August 1st-December 31st)	1,198	1,697	6,037
1939	4,315	5,973	19,142
1940	4,897	5,621	16,721
1941	4,370	4,323	13,508
1942	1,138	1,093	3,170
1943	1,721	1,721	5,454
1944	1,393	1,393	4,855
1945	−407	−407	−1,368
Sub-total, 1938 to 1945	18,625	21,414	67,519
National Housing Act, 1944			
1945 (February 1st-December 31st)	4,838	5,387	22,511
1946	7,341	11,827	55,951
1947	8,886	10,933	53,230
1948	15,313	18,776	104,291
1949	18,047	25,166	140,830
1950	33,934	42,280	284,487
1951	14,916	19,283	123,621
1952	23,718	34,323	249,084
1953	26,514	38,648	290,823
1954	4,629	7,603	56,313
1955	6	−97	−1,848
Sub-total, 1945 to 1955	158,142	214,129	1,379,293
National Housing Act, 1954			
1954 (March 22nd-December 31st)	34,946	42,516	397,197
1955	56,143	65,433	617,160
Sub-total, 1954 to 1955	91,089	107,949	1,014,357
Total, 1935 to 1955	270,939	348,391	2,480,788

a Data represent the total number and amount of approvals plus reinstatements and increases, minus cancellations, decreases and withdrawals. Includes Newfoundland from 1949 on and the Yukon and Northwest Territories from at least 1949 on. No indication given by source as to whether these latter areas are also included prior to 1949.

SOURCE: Central Mortgage and Housing Corporation, *10th Annual Report, 1955*, Table IV.

Table 4

DWELLING UNITS FOR WHICH LOANS APPROVED[a] UNDER THE NATIONAL HOUSING ACTS, BY PROVINCE, 1949-55

(a) Number of units	1955	1954	1953	1952	1951	1950	1949	1949 to 1955
Canada[b]	65,336	50,119	38,648	34,323	19,303	42,756	24,904	275,389
Newfoundland	344	166	168	27	33	51	21	810
Prince Edward Island	33	16	16	9	7	20	23	124
Nova Scotia	778	746	1,130	260	187	558	296	3,955
New Brunswick	667	391	333	182	126	348	225	2,272
Quebec	10,876	9,057	7,456	9,117	4,233	13,980	8,552	63,271
Ontario	33,498	26,170	18,839	16,038	9,416	17,830	9,353	131,144
Manitoba	3,403	2,540	2,050	1,916	1,100	1,826	1,569	14,404
Saskatchewan	1,982	1,040	832	629	137	360	193	5,173
Alberta	7,057	5,649	5,464	4,056	2,659	4,279	2,837	32,001
British Columbia	6,694	4,344	2,360	2,089	1,405	3,503	1,832	22,227

(b) Percentage distribution	1955	1954	1953	1952	1951	1950	1949	1949 to 1955
Canada[b]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Newfoundland	0.5	0.3	0.4	0.1	0.2	0.1	0.1	0.3
Prince Edward Island	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Nova Scotia	1.2	1.5	2.9	0.8	1.0	1.3	1.2	1.4
New Brunswick	1.0	0.8	0.9	0.5	0.6	0.8	0.9	0.8
Quebec	16.6	18.1	19.3	26.6	21.9	32.7	34.3	23.0
Ontario	51.3	52.2	48.7	46.7	48.8	41.7	37.6	47.6
Manitoba	5.2	5.1	5.3	5.6	5.7	4.3	6.3	5.2
Saskatchewan	3.0	2.1	2.2	1.8	0.7	0.8	0.8	1.9
Alberta	10.8	11.3	14.1	11.8	13.8	10.0	11.4	11.6
British Columbia	10.2	8.7	6.1	6.1	7.3	8.2	7.4	8.1

a Annual data are on a net basis, i.e., they represent gross loans approved during the current year minus cancellations or alterations of mortgage loans whether initial approval was made during the year or in prior years and irrespective as to whether mortgage loans were paid out in full or in part.

b Includes Yukon and Northwest Territories. The total for Canada differs very slightly from the sum for the provinces in 1949, 1950 and 1955, as a result of inclusion of these areas. Canada totals for 1949 to 1951 do not quite agree with those shown in Table 3, and reason for disagreement is not apparent.

SOURCE: Central Mortgage and Housing Corporation, *Canadian Housing Statistics*, 1955, Quarter 4, p. 17

Apartment houses and other commercial buildings are financed to a large extent through mortgages sold to large institutions on the basis of firm leases providing rentals sufficient to cover expenses and repayment. If the project can be shown to be economically feasible there should be no problem in finding a buyer for the mortgage. A variation which has become popular for commercial buildings because of its tax-saving feature is the sale and leaseback arrangement. Under this arrangement a builder or real estate operator sells the property to an investor and concurrently

enters into a long-term (20 to 25 years) lease with the investor calling for rentals sufficient to repay the purchase price with interest by the termination of the lease, at which time he has an option to repurchase the property for a nominal sum. The tax advantage is that the rental can sometimes be deducted from taxable income whereas mortgage principal payments cannot.

Businesses who purchase or build structures for their own use generally finance them as a part of their over-all financing, either out of accumulated profits or sale of securities or partly both. Sometimes a business will find it convenient or advisable to finance a building project by way of a separate mortgage on the project but this is the exception. Generally a lower rate of interest can be obtained by doing all borrowing on the general credit of the company and on its fixed assets. As a rule mortgages or mortgage bonds on commercial and industrial property are limited to two-thirds of appraised value.

Probably the greatest problem of financing at present is that faced by the municipalities. This problem is discussed in Chapter 7, but some mention should be made of it here. The municipalities, with rather limited access to capital markets, have found some difficulty in recent years in borrowing adequate funds for the provision of capital facilities. To meet this problem, in some parts of Canada, and particularly Ontario, the residential builder has been installing the services under municipal supervision, adding the cost to the selling price of the home. In this manner the services become financed largely out of mortgage funds and over a longer term than would otherwise be the case, and the municipality is relieved of the problem.

Financing the various parties to construction work in the United States offers some contrasts. Generally speaking, it may be said that financing is somewhat more liberal, most noticeably on homes. The equity requirements for the purchase of a residence are distinctly lower than in Canada. However, a higher down payment in Canada has not prevented a high rate of home construction, which compares not too unfavourably with that in the United States. (See Table 33 in Chapter 1.)

Machinery and heavy equipment are less expensive in the latter country, and more readily financed by banks, which can take chattel mortgages on such assets and are not restricted in the interest rates they can charge. This factor gives United States' firms an advantage when international bidding takes place, particularly in large engineering works, where machinery acquisition and write-offs weigh heavily in the over-all costs.

Methods of financing construction work, residential in particular, in the United Kingdom, differ somewhat from those employed here. While the process of financing the contractor for both tender deposits and equipment purchases is much the same, as are the corporate and public

authority financing, residential construction is financed largely by building societies. In the United States savings and loan associations have been providing almost two-fifths, banks and trust companies about one-fifth, and individuals and other sources the balance of residential mortgage funds. Insurance companies' participation was limited to less than 10%. In the United Kingdom, the building societies, of which there are about 750, provide about two-thirds of the mortgage funds needed for new residences as well as a large amount of funds for the purchase of older homes. These building societies obtain the major part of their funds, over 80%, through sale of shares, and the greatest part of the balance from depositors. In Canada, insurance companies and other lending institutions have financed the bulk of housing expenditures; although following 1954 the chartered banks became important sources of funds.

This section on financing has set forth the normal procedures for obtaining financial aid in the construction industry. By "normal" is meant operations in a situation where the general supply of credit is sufficient to meet the demands of creditworthy borrowers in all segments of the economy. However, the present tight monetary conditions have restricted the borrowing ability of many classes of borrowers and so have moderated the demand for new construction, especially in the house building field. More will be said about regulating cyclical fluctuations in construction activity in our concluding chapter.

Trade Associations

In giving particulars of certain associations below we have tried to choose representatives of the more important segments of the industry which are large enough to have achieved a well-developed organization.

Our investigations have indicated that there are many thousands of contracting units in the industry, ranging from self-employed house builders and tradesmen to public companies employing hundreds of men including engineers, architects and other "white collar" specialists, as well as tradesmen and labourers. Accordingly, it was not a surprise to learn that there is no single organization that can express the thinking or the needs of the whole industry.

The Canadian Construction Association is probably the most representative, although its actual membership is small in numbers. The latest membership list shows approximately 350 general contractors, 64 road builders and 250 trade contractors. There are also about 325 members who are manufacturers and suppliers of building materials and equipment and about 35 representing allied professions and services. Affiliated with the Canadian Construction Association are builders' exchanges in 27 cities and a number of other local associations.

The preamble to the by-laws of the Canadian Construction Association defines the objects of the Association as:

1. To promote better relations between the members and owners, architects and engineers;
2. To establish and maintain methods of practice between members within the industry;
3. To acquire and disseminate useful information concerning the industry;
4. To extend construction and improve conditions in the combined industries;
5. To co-ordinate the units of the industry in its producing, manufacturing, distributing, professional and constructive activities, thereby increasing its efficiency and extending its usefulness.

In practice, the Association's activities at present appear to involve labour relations, liaison with the federal government, questions of business ethics and information. These are discussed briefly here.

The Association acts as a clearing house for information concerning wages and basic working conditions and provides the employer representation on the National Joint Conference Board of the Construction Industry and on other boards and committees sponsored by the federal government. It also has a permanent committee which fosters apprenticeship training and immigration to augment the construction labour force.

The permanent staff of the Association, under the direction of the elected executive, prepares briefs and recommendations on government policy as it affects the construction industry and also provides contacts with government departments for the members.

As mentioned before, the Association has prepared a "Code of Good Practice" and a booklet covering bidding procedure for the guidance of members of the industry. Bulletins on matters of interest to the industry are sent to members.

The Canadian Construction Association, like most trade associations, is a servicing body rather than a regulatory one, and while its members include most of the larger units in the industry it is obviously not necessary to be a member to engage in the construction business. Consequently, the statistical information it uses in its publications and briefs is mainly derived from government sources and bears no definable relation to the operations of its members.

The functions of the builders' exchanges, 27 of which are affiliated with the Canadian Construction Association, are very similar to those of the latter, but on a local level. Negotiations with the building trades' unions are generally conducted through the exchanges, which also provide rooms

for meetings of labour and other bodies, supply wage rate information to the Canadian Construction Association and others and act as liaison with trade and government organizations.

The Montreal Builders' Exchange has about 460 members, of which 100 are general contractors, 220 trade-contractors and the remaining 140 are mainly suppliers. The Toronto Builders' Exchange had, at the end of 1955, over 700 members, consisting of 76 general contractors, 300 trade-contractors, 300 manufacturers and suppliers and 30 classified as services (insurance companies, trade journals, etc.). In addition to the general associations and builders' exchanges there are a number of other local associations and national bodies representing some of the more important sub-trades who conduct useful programmes in various sections of the industry.

From the points of view of membership and activity the National House Builders Association is one of the largest single employer organizations in the industry. In January, 1956, it had almost 2,000 members, of which about 900 were builders, 460 were sub-contractors, and over 600 were suppliers and others connected with the industry. The National House Builders Association has 29 affiliated local associations spread across Canada and in every province except Prince Edward Island. In addition, it has an affiliate known as the Project Builders and Land Developers Institute, with about 40 members, and other smaller affiliates.

The National House Builders Association publishes the *National Builder,* a monthly magazine which prints the directory of members, committee reports and articles of interest to the members. The Association appears to work closely with Central Mortgage and Housing Corporation on a national level and uses its magazine to acquaint members with changes in regulations, standards, etc., of the government agency. It is also active in encouraging good standards of practice among its members. One excellent idea being currently promoted is that of providing each house purchaser with an owner's manual dealing with the care and maintenance of the house and containing the names and addresses of the sub-contractors and suppliers who worked on the house.

The Ontario Road Builders' Association has been in existence for 28 years and has now 103 contractor members and 49 associate members. Its annual directory is an excellent booklet containing a statement of the objectives of the Association, a code of ethics, the by-laws and other useful information besides the list of members and associate members. The objects of the Association are patterned after those of its national affiliate, the Canadian Construction Association, and include service activities, such as furtherance of an accident prevention programme, study of contract and tender forms, the facilitation of interchange and rental of equipment and collective purchase of materials.

Appendix:

Canadian Construction Association—Code of Good Practice

Members of the Canadian Construction Association agree that, for construction work which is to be carried out on a competitive basis using complete working plans and specifications, and in order to protect the sanctity of all competitive tenders, these provisions should be followed:

1. Competitive tenders should be opened at a fixed time and in the presence of the tenderers or their representatives;

2. A contractor should neither seek nor accept information concerning a competitor's bid prior to the opening of tenders;

3. An owner should not re-call tenders unless there is a substantial change in the scope of the work, in market conditions, or other factors affecting cost; in such cases only the three lowest tenderers should be invited to tender again;

4. A contractor should use tenders only from qualified sub-contractors;

5. A contractor should never make known the tender of any sub-contractor to any other sub-contractor before the closing of tenders;

6. A contractor should never use the tender of a sub-contractor in order to secure a lower proposal from another bidder;

7. Sub-contractors should be advised immediately after the close of general contract tenders as to whether their tender was or was not used in the making up of the contractor's tender;

8. A contractor should award each sub-contract to the qualified sub-contractor tendering the lowest price; if the award is made to any other sub-contractor, it should be at the latter's tendered price;

9. A contractor should pay all sub-contractors and others as promptly and in the proportion as he is paid for his contract work;

10. All services performed by one contractor for another where payment is required should be recorded and signed for daily; agreement with regard to the payment for such job services should be reached and recorded in writing before work commences.

4

GENERAL TECHNOLOGICAL FACTORS AND THE CONSTRUCTION INDUSTRY

As MIGHT be expected in an industry composed largely of small units with little capital, engaged in turning out heterogeneous products on different sites, technological advances have not been nearly as spectacular as those achieved by other industries more susceptible to mechanization. However, progress has been made and is continuing, particularly in supplementing human energy and in the use of new materials. In this chapter we have attempted to point out the major lines along which such progress has been achieved.

Mechanization and Prefabrication

The extent to which the construction industry can use mechanical (or electrical) energy and hence become mechanized is limited to a certain degree by the nature of the industry itself. The fact that it is composed of many small, rather than large, firms is one of these. The nature of the work, at outdoor sites on projects which are unique in themselves, is another. These same limitations also impose restraints on the extent to which the industry can incorporate advances which go beyond the straight application of mechanical power. The mass production of standardized units of output which has revolutionized other industries and made possible tremendous increases in productivity seems destined to be applied to the construction industry only in so far as prefabrication proves successful. To date, prefabrication has not been adopted to any large extent. This will be dealt with later.

There are no data available for illustrating the extent of mechanization in the Canadian construction industry. The only data bearing on the question are the values of new and repair capital expenditures by the construction industry and by other industries. Table 1 shows these expenditures and the portion of them spent on new machinery and equipment, grouped in five-year periods back to 1926. For purposes of comparison we have also shown the current dollar value of construction and the percentage of that dollar value represented by expenditures on machinery and equipment and on total capital expenditures by the construction industry. The percentages in Table 1 understate the relative importance of capital expenditures by the construction industry because construction activity includes work performed by units outside the industry. Nevertheless, it is clear that the percentage of capital investment in the industry remains broadly unchanged from the levels of 30 years ago.

As a basis for comparison with other industries we have made use of the net value of production series, and the figures for expenditures on new machinery and equipment from the same source as Table 1. Forestry and manufacturing were chosen for comparison to give a balanced picture between an industry which might have mechanization problems somewhat similar to construction and one which lends itself to mechanization most readily.

In the five-year period 1949 to 1953, expenditures by the construction industry on new machinery and equipment totalled $308 million, or 3.4% of the net value of production of the industry. During the same period expenditures by the forestry industry on new machinery and equipment amounted to 4.3% of the net value of production and that by manufacturing to 7.5% of the net value of production. It would appear that construction has not been mechanized as fast as the forestry industry, and as would be expected, is far behind manufacturing.

On an historical basis, the figures in Table 1 indicate that there is no long-term trend toward greater investment in machinery and equipment relative to value of work performed. Thus, on the surface it would

Table 1

NEW INVESTMENT IN MACHINERY AND EQUIPMENT AND TOTAL CAPITAL EXPENDITURES, CONSTRUCTION INDUSTRY, 1926-55

Year	Expenditure on machinery and equipment	Total capital expenditures[a]	Value construction activity[b]	Percentage of value of construction	
				Machinery and equipment	Capital expenditures
	(millions of dollars)				
1955.....	96	183	5,288	1.8	3.4
1954.....	88	170	4,694	1.9	3.6
1953.....	81	167	4,637	1.7	3.6
1952.....	68	145	4,175	1.6	3.5
1951.....	59	107	3,661	1.6	2.9
1951-55.....	392	772	22,455	1.7	3.4
1946-50.....	228	459	12,058	1.9	3.8
1941-45.....	98	187	5,958	1.6	3.1
1936-40.....	44	89	3,708	1.2	2.4
1931-35.....	22	44	2,842	0.8	1.5
1926-30.....	99	185	5,023	2.0	3.7

a Including repair, maintenance and construction expenditures.

b Construction figures shown here are from *Private and Public Investment* and differ slightly from those shown in some of the tables in Chapter 1.

SOURCE: Department of Trade and Commerce, *Private and Public Investment in Canada, 1926-51*, and the *Outlook*, various issues.

appear that mechanization is not making much of an impression on the construction industry. However, we do know that much more mechanical equipment is now being used in the industry, even if investment in such equipment does not appear to be rising proportionately.

In the construction industry, the practice of renting machinery from firms with idle equipment is fairly common but unfortunately the extent to which this is done is difficult to estimate. The only indicative figures are those contained in the publication of taxation statistics by the Department of National Revenue, Taxation Division, which show the consolidated profit statements of fully tabulated companies. The figures show that increasing amounts are being spent on equipment rentals. The discrepancy between rentals paid and rentals received is due to the fact that the figures are for incorporated construction companies only, and that firms outside the industry rent to or from construction firms. However, the greater part of rentals takes place within the industry itself, which suggests that the figures for new capital expenditures given in Table 1 do not seriously understate the extent to which new machinery is being introduced into the construction industry as a whole.

The figures referred to are as follows, in thousands of dollars:

Year	Rentals Paid	Rentals Received
1944	601	1,442
1945	683	785
1946	1,077	1,214
1947	995	2,080
1948	1,305	1,063
1949	n.a.	n.a.
1950	n.a.	n.a.
1951	3,150	2,921
1952	4,526	3,516
1953	5,391	4,499

SOURCE: Department of National Revenue, Taxation Division, *Taxation Statistics*, various issues.

What determines whether a firm rents or buys a piece of equipment is primarily the volume of work to be handled by the machine, although the financial position of the user is also a factor. If there is not sufficient work to keep a machine active enough to pay for itself, it will be rented rather than purchased. As can be seen from the above figures, the practice of machinery rental is prevalent and growing apace with the volume of work performed. On some very large projects, however, machinery is acquired for the job and written off over the course of the job.

Opinions are fairly unanimous among the various segments of the industry that there is a trend toward greater mechanization, but that it is best described as a slow evolution. The three segments which can claim specta-

cular progress in mechanization are road building, pipelines and earth-moving. Characteristics of these types of construction activity, not possessed by other types of construction generally, are continuity of operation and opportunities for the profitable use of labour-saving machinery.

An auxiliary consequence of the trend toward mechanization deserves mention. A firm with relatively little capital investment is not severely affected by any seasonal idle periods. With negligible overhead costs, a shutdown is of no real financial consequence, apart from the problems of maintaining a skilled labour force. But as the firms become more mechanized, with a larger investment in fixed assets and higher fixed overhead charges, idle plant becomes costly and there is more incentive to even out seasonal fluctuations in construction activity. Nevertheless, the seasonal nature of the work makes investment in mechanization more risky than in other industries. However, the competitive advantages stemming from the use of machinery in road building and related work are great enough to offset the seasonal layoffs that climate imposes on some sections of the industry.

The adoption of new techniques and new materials has been another method of modernizing the construction industry, and relatively great improvements in efficiency will probably continue to be made by these means. The prevalent use of dry-wall construction in new houses is an excellent example of a new technique which involves the use of a relatively new product, wallboard.

Prefabrication is another outstanding example of modernization through the use of new techniques. The mechanization and materials involved are not new *per se*. The revolutionary aspect of prefabrication is in the application of mass production methods to an industry which has traditionally been a handicraft operation. With prefabrication there is a standardized product which can be varied by changes in such details as trim, colour, etc. Some of the advantages claimed for prefabrication, which contribute to a lower cost for the completed product, are more detailed pre-planning, less waste and pilferage than at an on-site location, and the possibility it affords for the greater use of power machinery.

In the United States at present, prefabricated homes constitute a sizable proportion of new housing production, amounting in 1954 to 7%, and in 1955 to some 8%. Prefabrication in Canada has been considerably slower in coming than in the United States and seems to enjoy its greatest popularity in western Canada. Canada presents a special problem in the field of prefabrication in that the weight of the end product, resulting in high transportation costs, places geographic limitations on the market for the output of any one firm. According to *Timber of Canada* (January, 1956, p. 28), one system accepted by Central Mortgage and Housing Corporation, makes wall sections, gable ends and trusses to specifications at the plant

and transports them to the site. The southern Ontario group of lumber dealers sponsoring the system may later add interior sheathing, insulation and wiring to the operations done at the plant.

The organization of the prefabricated housing industry follows a definite pattern. In the United States, a producer has a group of dealers, quite often construction firms, who sell the product. An inventory is not carried as a rule, the dealer-erector ordering a house when a sale is made. Now that prefabrication is gaining acceptance, the industry is beginning to look more like many manufacturing industries in the consumer goods field. Whereas previously the idea of prefabrication was advertised, now the brand name of the product is stressed. Further, some of the larger United States firms are endeavouring to run their own financing subsidiaries.

While prefabrication is the most radical new technology, a number of other new methods of construction are in use now. Partial prefabrication, if it may be called that, is in widespread use. This involves the off-site manufacture of doors, window frames, and wall and ceiling panels. While total prefabrication may have made relatively little headway, partial prefabrication, both off-site and on-site, has become a generally accepted method and the trend is toward a higher degree of prefabrication of individual parts, requiring less installation work on-site.

The acceptance of partial prefabrication, of necessity confined to some types of operations, and not universally applied, was borne out in interviews with construction firms. Residential builders replied that they did off-site work and some noted they were doing more and more. Only a few contractors engaged in non-residential construction foresaw more off-site work in the future. The rest showed reservations, some doing no off-site work, and others doing a little, but not expecting any increase. It should be noted, however, that the use of such manufactured materials as aluminum curtain walls and many others has reduced the scope for off-site prefabrication while it has cut down on the amount of on-site construction work. Among general building contractors, only about half did some off-site work and expected to do more. Road builders, of course, did all their work on-site, as did contractors engaged primarily in gas and oil construction, although again the use of ready-mixed concrete and the use of new types of pipe have reduced the amount of on-site labour. A very recent and extremely interesting development has been the lift-slab method of construction. This utilizes steel upright beams to bear the load. The concrete floors are poured one on top of another at ground level, with a layer of dusting powder and liquid wax between them. When hardened, these horizontal slabs are jacked up the vertical columns and held in place at their respective levels. Due to a smooth, machine-trowelled surface on the top of each level poured, the lower side of the level above is similarly smooth and requires no finishing. The major advantage is the elimination of the need for form work. Cost

reductions of 30% to 40% on the structural portion of the work have been claimed.

It is apparent that off-site work is limited to certain types of construction activity, but where it is possible, more off-site work will be undertaken in the future.

Standardization and Simplification

Closely related to prefabrication in the construction industry is the problem of standardization and simplification. Standardization, on an industry-wide basis, involves the acceptance of common definitions of dimensions, composition, quality, performance, manufacturing methods and testing methods.

The ultimate in standardization is "modular co-ordination". This involves co-ordination of design dimensions with material dimensions. Generally, the four-inch module is advocated which calls for all materials and designs to be in dimensions of multiples of four inches. The advantage of such a system is to minimize cutting and fitting on-site, everything going into the building — lumber, hardware, plasterboard, insulation, masonry, even the bathtub — being in sizes of multiples of four inches, plus or minus allowances for jointing. Acceptance of such a system would involve co-operation of the entire industry — architects and engineers, contractors and manufacturers — and partially because of the difficulty of such an undertaking, has progressed very little. Although the adoption of modular co-ordination is a logical development, standardization to a lesser degree does exist now, particularly in larger housing developments.

Perhaps more fundamental and immediately recognizable than the broader modular co-ordination plan are the advantages to be secured from making materials compatible with their immediate neighbours in the structure. An example of what is meant can be seen in bathrooms where frequently the dimensions of the tile used bear no relation to the dimensions of the bathtub and thereby cause considerable cutting and fitting.

Such simplification at the supply end could result in a reduction in material costs. Often there is a bewildering variety of shapes and sizes for a particular building product — this is particularly so in the case of brick. In such instances, the reduction in variety would permit volume production of one or two standard sizes and result in lower prices for the products. In so far as standardization of building products in Canada is concerned, it is likely to be imposed on the construction industry from outside the country. Many of the moulds for producing building products are imported from the United States. As the trend toward standardization and the use of the modular unit progresses there, it will be reflected in much of the machinery imported into Canada for the production of construction materials.

In some fields, however, progress is being made on domestic initiative. The director of building research at the National Research Council has

been quoted as predicting that the Canadian Standards Association will adopt standard-size concrete blocks and brick units. However, at the time of writing, such action had not yet been taken.

It is felt that the standardization of dimensions, and its logical objective, modular co-ordination, could offer considerable advantages with little need for significant changes in present methods. The economies have been demonstrated. In 1947 at the University of Illinois, the Small Homes Council of the University and the United States Department of Commerce's Office of Technical Services, sponsored a project involving six houses, three of masonry and three of frame construction. Two houses were built, one frame and the other masonry, using conventional methods. Following this, two more, one of each type, were built using some techniques of modular co-ordination. The last two built used methods which had recommended themselves in the previous homes, including modular co-ordination. The results of these, when costs were averaged for houses built using modular co-ordination, showed savings in man-hours of 21%, and savings in total cost of 10%.

However, many materials which are modular in size are in common use in this country. It must be admitted that in most cases they are modular by accident, but the fact remains that insulation batts, wallboards, most concrete blocks, and many metal and wood window assemblies are modular. Nevertheless, there has been relatively little done in Canada to extend the use of modular co-ordination. The S.C.R. brick is probably the first material introduced into the construction industry in Canada, which was designed as a modular product. This had its origin in the United States but is now produced in Canada.

The chief difficulty in implementing a change to modular co-ordination and likewise to lesser degrees of standardization is that a number of groups must be in agreement. Some architects and engineers have objected to this development on the grounds that their freedom of design is restricted. On the other hand, opposition from material manufacturers stems from the fact that a changeover would necessitate the scrapping of present moulds for new modular moulds. It must also be remembered that the industry is largely building a custom product which does not gain from standardization to the extent that other industries do. The advantages are not only relatively smaller, they may be more difficult to visualize.

For the above reasons, the chief hope seems to be in new materials. If new materials were produced in modular sizes, certainly it should require no larger investment in plant, and since it is possible to use modular items in a design which is not primarily modular, such items could be relatively easily introduced.

As an indication of the vast possibilities for standardization, reference is made to activities in the United States. During World War I efforts were first made there to cut down on the immense variety and dimensions of materials. A number of organizations, such as the American Standards

Association Inc., The National Bureau of Standards, and the Commodity Standards Division of the United States Department of Commerce, have been active since early in this century, and tangible results have been achieved.

The possibilities for reducing the great variety of present materials by means of standardization are shown in Table 2. Since the economies of standardization have been well documented in connection with the actual erection of a building and since it would also permit economies for manufacturers and material dealers through reducing the size of stocks necessary, we may expect gradual progress in this direction.

Table 2

RECOMMENDED REDUCTION IN VARIETY OF SELECTED BUILDING MATERIALS AND EQUIPMENT

Commodity	Number of Varieties[a]		Percentage Reduction
	Before	After	
Stone, clay and glass products:			
Common brick	44[b]	1	98
Hollow building tile	36	20	44
Clay sewer pipe and fittings	1,600	548	66
Structural slate	827	118	81
Roofing slate	1,260	309	75
Asbestos millboard	21	4	81
Fabricated metal products:			
Hot water storage tanks	120	14	88
Stove pipe and accessories	25	7	72
Solid section steel windows	248	115	54
Woven wire fence	552	69	87
Metal lath	125	24	81
Tacks and nails (sizes)	421	182	57
Primary metal products:			
Steel reinforcing bars	32	11	66
Steel reinforcing spirals	7	4	43
Miscellaneous machinery: (Valves and fittings)			
Pipefittings	8,566	2,969	65
Brass or bronze valves (pressure ratings)	11	5	50
Iron valves (pressure ratings)	12	3	75

a Before and after adoption of a simplified practice recommendation.

b Although SPR 7-24 specifies one size, some brick manufacturers still produce from five to seven sizes, depending upon market demand in different geographic areas.

SOURCE: United States Department of Labor, *Cost Savings through Standardization, Simplification and Specialization in the Building Industry*, 1954, p. 15.

Simplification, which is complementary to standardization, is of two types: design simplification which works toward better utilization of materials without impairing the quality of the product; and method simplification which attempts to provide an easier or shorter process for manu-

facturing a component or end product. Both attempt to secure economies through reduction of labour and material costs, by either reducing the number of operations involved or increasing efficiency.

Simplification is inherent in many innovations introduced into the construction industry in recent years. An example appears in the case of the lift-slab type of construction mentioned earlier. This technique eliminates large amounts of form work, which is in effect a simplification in that the number of operations involved in making concrete floors is reduced. Similarly prefabrication, regardless of degree, results in simplification through permitting the same operation to be fairly easily duplicated, as on a jig, or a preset power saw.

No one can deny that the designs and decoration of modern residential, commercial and industrial buildings are excellent examples of product simplification, but how much farther this can go is debatable on both functional and artistic grounds. As far as the builder is concerned, his product is made to order and he must use his ingenuity to devise simplified methods of making the product the customer requests.

Materials

The basic materials used by the construction industry, in various stages of fabrication, are shown in Table 3. The list is American, but it is believed that no substantial change is required to adapt it to Canadian conditions. More general classifications are also available showing the relative importance of seven product groups used in construction. These are shown in Table 4.

Table 3

THE BASIC MATERIALS OF CONSTRUCTION

Chemicals	Metals	Stone, clay and glass
Creosote	Aluminum	Asbestos
Formaldehyde	Chromium	Cement
Linseed oil	Copper	Cinders
Pigments	Iron and steel	Clay
Resin and gum	Lead	Crushed stone
Tung oil	Magnesium	Glass
Turpentine	Molybdenum	Granite
	Nickel	Gravel
Cotton	Slag	Gypsum
	Tin	Lime
Forest products	Zinc	Limestone
Cork		Marble
Paper	Petroleum and coal	Porcelain
Wood	Coal tar	Sand
	Petroleum	Sandstone
Hair and wool		Slag
	Plastics	Slate
		Soapstone
	Rubber	
		Vegetable fibres

SOURCE: M. L. Colean and R. Newcombe, *Stabilizing Construction, The Record and the Potential*, McGraw-Hill, 1952.

Table 4

RELATIVE IMPORTANCE OF VARIOUS CONSTRUCTION MATERIALS IN USE IN CANADIAN CONSTRUCTION, 1950

Type of Material	Distribution in New Building Construction[a]	Distribution in All Construction, New and Repair[b]
Iron and steel products	35.6	28.3
Lumber and wood products	24.5	24.6
Non-metallic mineral products	25.2	23.8
Electric equipment	8.2	12.0
Paper products	2.9	6.3
Paints and varnishes	2.5	5.0
Total	100.0	100.0

a Prepared by Price Division, D.B.S. for use in price indexes.
b Based on domestic supply of construction materials.
SOURCE: Unpublished study of the Economics Branch, Department of Trade and Commerce.

In spite of the relative importance in construction of iron and steel products, of which Canada is a substantial net importer, by far the greater part of building materials used in Canada are of domestic origin. The extent to which this is so is indicated by the data in Table 5.

Table 5

ESTIMATED IMPORT CONTENT OF CONSTRUCTION MATERIALS USED IN CANADA, 1950

Type of Material	Percent Domestically Produced	Percent Imported
Iron and steel products	75	25
Lumber and wood products	95	5
Non-metallic mineral products	87	13
Electrical equipment	96	4
Paper products	98	2
Paint and varnishes	96	4
All construction materials	88	12

SOURCE: Unpublished study by the Economics Branch, Department of Trade and Commerce.

There are, of course, short-run variations in the import content of Canadian construction materials. In times of shortages imports of construction materials, especially from the United States, are likely to rise as has been the case recently with steel and cement. This means that if a material is in short supply domestically for a short period, construction may not be held up if the material can be imported.

A number of new construction materials have been introduced into the market in recent years. Plywoods and aluminum are two of the most common products new to construction in the last ten years or so. The Aluminum Company of Canada Limited estimated, in its submission to the Commission, that currently 10% of its output is used in construction. In the United States, the use of aluminum in construction is even more advanced. Other new materials coming into general use in recent years are plastics in building and residential construction; precast panels of cellulose or lightweight aggregate concrete; asbestos; steel in new uses, such as structural steel flooring and reinforced concrete designs; wall boards for dry-wall construction, and prefabricated wall panels; terrazzo flooring; new insulations of glass and sea weed; glass panels; laminated woods; rubber base paints; copper piping; metal chimneys; new flooring materials; fibre pipes and panels; and general pre-manufactured and pre-fabricated parts.

Building materials are produced in Canada by many firms. Between the producers and the much greater number of users is a multitude of wholesalers, jobbers, dealers and manufacturers' agents. Distribution channels vary for different materials and no broad generalization would apply to the industry as a whole. Several classes of materials, though, do have reasonably fixed channels for distribution: brick, building tile and structural steel are as a rule distributed to the contractors by the manufacturers. Some materials on the other hand are often installed by the distributor who may be the manufacturer, a sub-contractor or other intermediary agent. This is usually the case for linoleum, plumbing and heating fixtures, and electrical fixtures.

As a rule, a distributor must carry a fairly substantial stock because of the tremendously wide variety of materials and lack of standardization. For example, in the United States there are more than 8,000 varietites of pipe fittings and 44 kinds of sand-lime bricks.

Another important aspect of the distribution system for building materials is the significant role of the distributor in financing. The general practice is for materials to be delivered to the building site prior to payment. Payment for these materials is generally on a 30-day basis, which coincides with the terms for progress advances received by the contractor.

It is not the general practice of firms in the construction industry to carry large stocks of building materials. Rather, general policy is to purchase requirements after the award of a contract, specifying delivery dates to coincide with progress. In this manner, funds are not tied up in inventories any longer than necessary and storage of materials, both at the construction firm's location and on-site, is kept to a minimum. Some construction firms do speculate, at times, in building materials, attempting to purchase in advance materials which are expected to be in short supply or higher in

price. In addition, some road-builders make a practice of purchasing materials like sand, gravel, crushed stone and cement in the winter months, up to six months ahead of requirements.

Information gathered from firms in the industry indicates that new materials generally result from the initiative of manufacturers in searching for new applications of already discovered substances. Manufacturers of building products are devoting considerable energy to the development of new materials, and to broadening the market for those currently in production. Cost reduction is the prime consideration in the introduction of a new product — not necessarily the cost of the item itself, but the over-all cost reductions that the new material will produce. While the intent of building specifications is to ensure that the quality and durability of materials is not sacrificed to cost considerations, the life span of most buildings now is so long that even greater durability is not a prime motive in the search for new materials. Indeed, a common characteristic of many new materials which have been widely accepted has been their light weight, combined with strength and durability comparable to those of much heavier materials.

The use of new materials is, of course, conditional upon their being accepted by the building authorities. The acceptance of new materials involves each authority concerned with the structure. Thus, before a new material can be incorporated into a house being built under the provisions of the National Housing Act, it must be accepted by Central Mortgage and Housing Corporation. This involves the submission of test reports from recognized authorities or the testing of the material, for a fee, by the Division of Building Research of the National Research Council or by a commercial laboratory. Acceptance by Central Mortgage and Housing Corporation, though, does not necessarily mean acceptance by local authorities, since local building codes also apply to the structure. However, local acceptance frequently follows Central Mortgage and Housing Corporation acceptance. Further, when the question of safety arises, provincial authorities become involved in passing on the use of new materials. The acceptance of materials by the market and by the labour unions is, of course, also necessary if those materials are to be widely adopted.

It is anticipated that the future will see two main developments in the use of new materials. First, there will be greater use of materials which are finished or fabricated to a higher degree than at present to minimize on-site labour cost. Second, there will be wider acceptance and use of lightweight materials, owing to both the reduction of costs of erection because of easier handling *and* the reduction of costs for supporting structural members. Further, there seems to be a growing realization of the advantages of building to more accurate standards of stresses, which allows greater use of lighter materials.

Research in Canadian Construction

Until 1947, when the Division of Building Research of the National Research Council was formed, construction research in Canada was mainly carried on by universities, government agencies and the large manufacturers of building products. Among Canadian universities early involved in construction research were the University of Saskatchewan and the University of Toronto. The former commenced studies in the early 1920's which led to the production of an alkali-resistant cement, and later worked on other projects including the design of a new type of bridge and investigations into building materials and methods. The University of Toronto, through its School of Engineering Research established in 1917, has contributed to the knowledge of the industry by studies of individual problems.

Government agencies involved in construction research before 1947 include the Mines Branch of the Department of Mines and Technical Surveys; the Forest Products Laboratories Division of the Department of Resources and Development; the Prairie Farm Rehabilitation Administration and the Hydro Electric Power Commission of Ontario. The Mines Branch has studied building materials of mineral origin and has been active in assisting in the development and use of materials, such as clay products, building stone, insulating materials, asbestos cement products, roofing granules and gypsum products. The Forest Products Laboratories Division has operated since 1913 and has worked on such things as timber engineering, plywoods, wood preservation, wood paints and coatings. The Prairie Farm Rehabilitation Administration has carried out studies on special problems relating to water conservation, irrigation, regrassing and improvements in methods of cultivation. The Ontario Hydro began in 1919 to study soils and concretes in its laboratories in an effort to secure economies in construction and methods of controlling quality in materials. Studies were also made of wood preservation, metallurgy and construction methods.

An important step forward in Canadian construction research came in 1947 with the formation of the Division of Building Research of the National Research Council. This Division has three specific functions: providing a research service for the building industry in Canada, acting as a research wing to Central Mortgage and Housing Corporation in technical aspects of housing, and providing necessary technical and secretarial services for the Associate Committee on the National Building Code and for the Canadian Government Specifications Board. Central Mortgage and Housing Corporation has provided the division with about half its work to date. The Division works in close association with the Associate Committee on Soil and Snow Mechanics of the National Research Council, which was organized in 1945 to deal with related military problems and which supports and promotes, but does not undertake, studies. Many of the Committee's findings are classified, and hence not available.

At the outset, it was decided that the Division's work would be limited to problems arising out of conditions peculiar to Canada, and that in order to prevent duplication of effort, close liaison would be maintained with foreign institutions in the field as well as other Canadian organizations. Owing to the diversity of local conditions, building problems have been numerous. In the past, there have been five main problems for investigation: discovering suitable building materials and techniques for construction in the far north of Canada; fire research; snow and ice research; soil mechanics and foundation research; and the enclosure of buildings. The work, in consideration of different local problems, has necessarily been organized on a regional basis, with work proceeding at a number of sites across Canada, and at one site in the United States. So far, the Division has been mostly concerned with applied research in relation to occurring problems rather than with long-term pure research.

The Division has also started a two-day course for builders, on an experimental basis, in various parts of the country. It is primarily for house builders, and it is based on a discussion of good construction methods. The idea was launched in April, 1955, and at the time of writing had not yet been formalized because it was not yet clear what the needs were in this type of work.

Longer term projects undertaken, or scheduled to be launched, by the Division are a study of winter construction, and a detailed study of housing. The Division is compiling accurate weather data, to relate to building requirements in different climatic areas of Canada, and has undertaken studies of various building materials and methods, and soils as related to construction. The results of the Division's studies are published and made available to the industry.

Construction research activities in Canada of private concerns relate mainly to new materials and machines. These are continually coming on the market as the result of investment in research by manufacturers and suppliers. This research naturally is motivated by competition and the search for profits. Construction firms themselves do not participate as it is not their function, and in most cases they are not large enough to support such work.

A number of newer materials, such as plastics, bonding agents, and light-weight materials, which may or may not have been the original object of research, are nevertheless supporting such research through sales. Some of the new substances being substituted for the traditional materials are the products of firms which formerly had no markets in the construction field. At present, there are firms in the chemical and metal industries entering the building materials field. These firms traditionally spend large amounts of money on product and market development. Over the long run the entry of such firms into the construction materials business will undoubtedly

cause more and more to be spent on research of benefit to the construction industry.

There are no figures on the amount spent on research in the construction industry in Canada, but it is not likely to be greater than for the British construction industry. In 1955 there was only the equivalent of 200 full-time workers employed on research and development in the construction industry of the United Kingdom, which represented only a fraction of 1% of the total employed in the industry. Further, the British construction industry spent only £300,000 on research and development in 1955 or less than 0.2% of total research expenditures by all British industries.

Zoning Laws, Building Codes, Licensing

In addition to the vagaries of climatic conditions, the construction industry must adapt itself to man-made conditions which also vary in different parts of the country. The most important of these are zoning regulations and building codes. The former regulate the heights and types of buildings, designating the areas in which different types of buildings may be located. Building codes, on the other hand, set up standards for construction of buildings, regulating the design and materials incorporated in the building.

Zoning in effect subdivides an urban area (for it is predominantly an urban phenomenon) into districts. In each district, certain types of structures are permitted while others are not. For instance, there may be strictly residential districts; residential districts where certain businesses are allowed to operate; retail business districts where heavy industrial and commercial enterprises are excluded; general commercial districts excluding heavy industry; and industrial districts where residential buildings are not permitted.

These limitations do not, it is felt, have any significant *net* effect on the construction industry. They do not dictate architecture to any significant degree (except where restrictions are imposed upon height or some such dimension, and this may be thought of as a code regulation), or materials, but merely lay down the location permissible for various structures, which is a matter of municipal jurisdiction.

Building codes regulate the architecture and material components of buildings. Building codes were allocated to provincial jurisdiction under the British North America Act, but have since been delegated to the municipalities. Exceptions to this are such items involving public safety as elevators, pressure vessels (i.e., steam plants) and electrical wiring.

The chief object of building codes is the promotion of public health and safety through the use of proper standards, mainly as regards fire prevention, sanitation, and structural adequacy. The Associate Committee on the National Building Code estimated, in a brief to the Commission, that more than two-thirds of current building in Canada is

proceeding under some form of control. As a rule, codes concern buildings and simple structures and do not relate to engineering structures.

Examination of any code illustrates the profound effects upon the construction industry. One manufacturer of building materials pointed out that good codes not only upgrade buildings but can aid in the acceptance of new materials. In introducing new materials, the most difficult task is gaining acceptance by the trades, the architects, and the ultimate owner. Through documentation, an up-to-date code can help in this. However, criticisms of building codes are frequent and in some respects well founded. When a code becomes outdated or specifies minima in terms of material rather than properties, a definite limit is imposed upon the use of modern architectural methods and new materials. A code may, for example, specify that walls must be of masonry, and of given thickness, based upon the premise that the wall will carry a given load. But, in modern construction, the exterior wall may carry no load, its only function being to enclose the structure, keeping the elements out and the people in. It would be advantageous to have this exterior skin as light as possible for economy and to make the best use of new materials for the purpose.

A further example was provided by a large manufacturer of building products. New materials, he pointed out, are all too likely to fall into some previously established classification, and therefore to be required to comply with standards which are not pertinent to the product. For example, brick may be required to have a certain compressive strength, not for structural strength but for durability. The new material may have the durability of brick without the compressive strength but at the same time have adequate compressive strength for its function. Thus, it is most important that building codes be as flexible as possible so that they do not hinder the adoption of new materials. It is also important that they be written in terms of properties and not materials.

Steps toward uniformity of building codes were attempted through compilation of the National Building Code of Canada, first issued in 1941, jointly by the National Research Council and the Department of Finance. A revision was published in 1953. This Code is a purely advisory document, having no legal effect until adopted as law by a municipality. By the end of 1953 the Code had been adopted in whole by 65 municipalities and was used in part, or as a basis for their codes, by 176 municipalities. A further 113 municipalities were considering adoption of the Code and 179 used it as a reference. The combined populations of all these municipalities (1951 census) was some 4,000,000.

The National Building Code has received wide recognition as one of the better codes in existence and it is felt that the 1953 edition is a considerably improved document. It is the intention of the Associate Committeee on the National Building Code that the Code be kept under continual review, in order that it may be up to date at all times.

Somewhat related to the subject of building codes is that of standards. The Central Mortgage and Housing Corporation publishes a booklet of standards to which construction must conform to qualify for mortgages under the National Housing Act. A system of inspections ensures that construction complies with the standards. The standards established by Central Mortgage and Housing Corporation adhere very closely to the requirements of the National Building Code and there is a provision that if a local code requires something in excess of Central Mortgage and Housing Corporation standards, the former will apply.

It must be apparent that code regulations are quite necessary. Unless there were such building regulations, a tremendous number of abuses could exist, particularly in the field of residential construction. Here the buyer knows very little about the techniques of building and is as a rule in no position to supervise the construction of his home. Even at present, with codes and standards in effect, and a system of inspections by authorities, abuses have become apparent. Uniformity in building regulations would seem a desirable object. A degree of uniformity has been obtained in Canada through the relatively wide acceptance of the National Building Code but there is still considerable room for further progress.

Licensing of general contractors is not a Canadian practice, although from time to time it is suggested in different areas. In some areas of the United States there is a licensing procedure, but there seems to be a certain amount of dissatisfaction with it. The object of such a system is, as a rule, to assure the competency of firms in the industry. Whether a licensing system can assure this competency is an unanswered question. The chief objection to licensing schemes, and this is heard in those United States areas where schemes are operative, is that an element of politics may be present in the issue of licences. There is the further danger that a licensing system may become merely a source of revenue and bear no relation to regulation for competency. Further, since building codes and inspections must be satisfied in almost all cases, it is to be doubted that a licensing procedure would be as effective as a thorough inspection. However, as noted in an earlier chapter, licensing is widespread in connection with two construction trades: plumbing and heating, and electrical, mainly for reasons of sanitation and safety.

5

EMPLOYMENT CONDITIONS IN THE INDUSTRY

Size and Distribution of the Construction Labour Force

One of the most important ways in which construction contributes to the well-being of the economy is through the employment it creates. In 1955 it was estimated that construction put into place by contractors alone accounted for an average monthly employment of 367,000 persons. Other estimates on a slightly different basis are reviewed in the following pages. Construction activities of utilities, governments and other individuals and organizations outside the construction industry provided employment for almost another 200,000, on a monthly average basis. Nor can an assessment of the employment implications of construction activity stop at this juncture; for employment generated off the site in the building materials and transportation industries probably equals, or may even exceed, the amount of on-site employment. As it is the purpose of this chapter to concentrate upon employment conditions in the industry, rather than upon the implications of direct and indirect construction employment for the economy, the latter aspects will not be pursued further. They have been noted here primarily to avoid minimizing their importance.

Measures of on-site construction employment fall into two categories — that for the construction industry, and that for construction occupations. The industry coverage aims at the inclusion of all people working for the industry, whether or not they are actually engaged in construction occupations. In actual fact, as Table 1[1] shows, only about three-quarters of the people in the construction industry were engaged in construction occupations or as construction labourers at the last census.

The occupational classification for construction employment includes only those persons in the construction industry working at construction jobs; it also includes persons in other industries who are putting construction work into place. Thus, the industry and the occupational classifications, although differing in definition and emphasis, have a common core, which frequently has meaning in either context. This is especially true for certain characteristics of the industry's work force, which can only be described through reference to the occupational data because of the absence of data on an industry basis.

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[1] Tables for Chapter 5 may be found grouped at the end of the chapter.

Actually, there are several estimates for employment in the industry and in construction occupations. These are summarized in Table 2, for 1951, the last census year, and for 1954, the latest year for which, in most cases, data are available. Data based upon returns to the Unemployment Insurance Commission provide the lowest estimates; the construction reports published by the Dominion Bureau of Statistics give the highest. Data from other sources — employment and payroll data collected from firms employing 15 or more persons, and the labour force sample survey — fall somewhere between the two, as do the census data for 1951. More detailed discussion on these various estimates appears in the appendix to this chapter.

The census estimated that approximately 344,889 males were working in the construction industry in 1951. This amounted to more than 8% of the total male labour force for all of Canada, with the highest ratios of males in the provincial labour forces working in the construction industry in Quebec, British Columbia, and Ontario. It was found in Chapter 1 that these provinces also have carried on the most extensive construction programmes in recent years.

The percentages of construction workers to total employees for Canada and each of the provinces from 1901 to 1951 are summarized in Table 3. By 1951 construction employment in most provinces had attained a level of importance that had not been recorded in the earlier censuses. Only in Manitoba, Saskatchewan and British Columbia were the 1951 percentages below the 1911 levels, and the trend was definitely upward in each of those provinces.

A comparison of the distribution of construction employment with the distribution of the value of construction work in recent years indicates a substantial amount of agreement between the two. Differences do arise however, which may be due to such factors as variations in the type of construction work performed, the relative productivity of the construction labour force, or variations in material and labour costs in different areas. Table 4 illustrates how construction employment and the value of construction are divided among the provinces. The most striking differences in the patterns of distribution occur in Quebec, Alberta, British Columbia and Ontario. Quebec's share of employment exceeds her share of the value of construction to a greater extent than in any other province, while the opposite is the case for Alberta, British Columbia, and Ontario. Differences throughout the rest of Canada are small.

Where large differences exist, as in Quebec, Alberta, British Columbia and Ontario, they may be due to variations in the costs of labour and materials or to differences in productivity, or to a combination of these factors. It can be substantiated that rates of pay for construction workers are higher in British Columbia, Ontario and Alberta than in other parts of the country, and this would go a long way toward explaining the

differences shown in Table 4. Levels of productivity also differ according to the importance of engineering, residential and non-residential activities as components of total construction.

It is generally assumed that construction is a predominantly urban activity. If this is so, it can be expected that the construction labour force is also recruited largely from urban areas. The census of 1951 found that for Canada as a whole, approximately 75% of the labour force participating in construction occupations was residing in cities, towns and villages of 1,000 or more population, as compared with 62% for the population as a whole. The rural-urban distribution of workers on an industry basis is given in Table 5. For Canada as a whole, 71.3% of workers in the construction industry lived in urban areas. The urban concentration of workers was highest for Alberta, British Columbia and Quebec, and lowest for the Atlantic provinces.

Of the 350,896 persons working in the construction industry at the time of the last census, 79.1% were in branches of the industry engaged in erecting buildings and structures as shown by Table 6. There were approximately 14.9% of the industry's workers throughout Canada in branches specializing in highway, bridge and street construction. Heaviest emphasis in this respect occurred in the Atlantic provinces, where 25.9% of the workers were employed in highway, bridge and street construction.

Table 1 shows workers in construction occupations employed by the construction industry amounted to about 55.7% of the industry's work force. Because these workers are so basic to the functioning of the industry, they warrant some further consideration. As much of this analysis must rely upon examination of the occupational statistics, the degree of comparability of the role of construction occupations in the industry with their role in the economy at large is significant. Tables 7 and 8 help to define this relationship. In Table 7 the various groups are listed according to the order of their importance in the construction industry, and the total number and proportionate importance of each group is indicated for all industries as well as for construction. Table 8 shows that the proportion of all workers in construction occupations who are employed in the construction industry varies from 97.2% for plasterers and lathers to 39% for electricians and wiremen. On the average, the construction industry employed about 65% of all those in construction occupations.

Table 7 indicates the relative importance in 1951 of the various groups working in construction occupations throughout Canada. If the distribution of these occupational groups is considered regionally, some differences can be anticipated. This arises from the fact that the type of construction performed in the different areas varies in emphasis, and of course the proportionate need for the different skills is influenced by the kind of work performed. Thus we may expect greater proportions of workers needed for engineering construction in Alberta and British Columbia;

higher proportions of workers specializing in roadbuilding activities in the Atlantic Provinces; and greater concentration of the trades associated with building activities in Ontario and Quebec. Except for such special regional requirements, however, workers will tend to be distributed among the regions more or less according to the regional distribution of the value of work performed. Table 9 gives the distribution of the value of construction completed in the various provinces throughout Canada in 1951, and Table 10 shows the provincial distribution of construction workers.

We have found that the construction labour force appears highly urban in nature, and that provincially, as might be expected, it is concentrated in Ontario and Quebec. While the Atlantic provinces tend to have the smallest portion of the construction labour force, it is the western provinces — especially Alberta and British Columbia — which have probably experienced the greatest shortages of construction workers. However, it is known that in these provinces there is a greater use of non-resident construction workers than in other parts of the country, especially for specialized jobs.

In view of the fact that construction employment is so highly urban in character, a look at the distribution of the construction labour force in various cities throughout Canada may be of interest. Table 11 gives the number of persons employed in the construction industry, according to major types of construction, in cities of 100,000 population or over. Table 12 gives the occupational distribution for males in construction occupations in selected larger cities at the last census. Comparison with the occupational distribution for all construction workers in Canada as given in Table 7, indicates relative variation in the importance of the types of construction labour among the cities.

There is little discernible consistency in the distribution of the workers in construction occupations in the large cities. Whether or not variations of the city distributions from that for all Canada represent shortages or surpluses of certain construction trades cannot be assessed without a painstaking examination of local conditions, which is not feasible for the present investigation. For instance, the wider use of brick and stone as building materials in the Toronto-Hamilton area, partially due to municipal ordinances, might explain the high proportion of brick and stone masons in those cities. Similar factors would doubtless explain a good part of the variations in distribution of workers in construction occupations in other cities. Such factors may result in specific concentrations of certain types of labour which are in short supply for the province as a whole, or may otherwise alter the distribution over the province or over the country as a whole.

Seasonal Variation in Employment in the Industry

Each year, from January to March, with minor variations, the trough of activity in the construction industry appears, while the peak in activity occurs during the summer months. This seasonality in the pattern of operations, resulting from climatic factors, is not peculiar to the construction industry. Many other industries are similarly affected, especially logging, fishing, inland shipping, retail trade, meat processing and garment manufacturing. However, although the percentage of the industry's workers affected is exceeded by that for logging, the total number of workers affected is higher in the construction industry than in any other. Even when new industry records are being established, as in the 1945 to 1950 period, declines of almost 25% from the average monthly employment of the year have been experienced.

The seasonal pattern of construction activity can be judged from variations in the number of contracts awarded from month to month throughout the year, for which data are presented in Table 13. These figures have been averaged for each month over the ten-year period from 1946 to 1955 to smooth out extreme fluctuations. Such figures can be regarded only as rough indicators of seasonality in the industry, because nothing is known about the size of individual awards. If the annual number of all types of contracts awarded were evenly spread, then in each month they would amount to about 8% of the annual number of awards. In actual fact they varied from less than 4% to more than 12%. In the month of lowest activity, only 3.3% of average annual residential contracts were awarded, 4.1% of the engineering, 6.3% of the industrial, and 5.3% of the business construction awards. In the peak month, 12.3%, 10.5%, 10.1% and 10.8%, respectively, of annual residential, engineering, industrial, and business contracts were awarded. With the exception of industrial work, the timing of these periods of low and high number of awards coincided, occurring in January and June respectively. The low point for industrial contracts occurred in February, and the high in November.

In Table 14, variations from average monthly employment in construction for the years 1945 to 1950 are given. For Canada, these variations at the peak amounted to from 115.7% to 118.8% of the average, and at the trough from 74.3% to 81.1% of the average. The peak employment in the industry was reached in August in four of the six years, and in July and October in the other two. The low point occurred in February in four years and in January in two. This is a composite and it must be remembered that all types of construction are not affected to the same degree.

Regionally, the pattern of seasonal employment in construction varies somewhat. The Maritime Provinces show the greatest relative variations, differing from the average at peak and trough from about 30% to more

than 40%. The next most severely affected area is the Prairies, where variations are slightly less pronounced; while British Columbia, as might be expected, has the least seasonality. There was not a great deal of difference regionally in the timing of the extreme points of employment and unemployment, although both the low and high employment periods seemed to fall about one month later in the Maritimes than elsewhere.

The incidence of seasonal employment variations does not fall evenly upon all types of construction workers. The figures in Table 15 show the *net* number of workers for whom there were no jobs available, broken down into unskilled, skilled, and semi-skilled workers. Figures not in brackets indicate there were more applicants than job openings; figures in brackets indicate an excess of job opportunities. This method of indicating the incidence of seasonal change by balancing the number of openings against the number of applicants is subject to some duplication as some reported as unemployed may not be actively seeking work, but may have registered with the Unemployment Insurance Commission to draw benefits. The table gives a somewhat distorted picture for earlier years, showing the extreme shortages of workers immediately after the war which reduced the impact of seasonality considerably. However, under more normal circumstances the unemployment problem has again arisen in slack periods. The effects of seasonality are falling more heavily on unskilled workers, although this may be mitigated to some degree by their greater mobility, as unskilled workers may shift to another industry readily while skilled and semi-skilled workers may not possess the same degree of mobility. It therefore follows that conditions in other industries which offer alternative employment have a marked effect upon the fortunes of unskilled construction workers seasonally displaced.

From the figures presented in Table 15 it will be noticed that, rather than diminishing, the problem of seasonal unemployment is growing in absolute size with growth of the industry. In the individual trades shown in Table 16, in absolute numbers, carpenters are most seriously affected, followed by painters, bricklayers, plumbers and pipe fitters. Least affected are plasterers.

Another indicator of the relative severity of the impact of seasonal fluctuations upon the various classes of labour in the construction industry is to be found in Table 17. The "seasonality ratios" there were computed by relating the average of the unemployment lows (i.e., the three months in each year with the lowest number of unplaced applicants) for the years 1952 to 1954, to an average of the unemployment highs (i.e., the three months in each year with the highest number of unplaced applicants) for the years 1953 to 1955. The "high" averages were divided by the "low" averages so that the resulting ratios show the number by which the "low" figures must be multiplied to obtain the "high" figures. Thus, the higher the ratio, the greater the relative difference between the extremes of

high and low unemployment in the various trades. The ratios indicate that for Canada as a whole, seasonal fluctuations in employment have been most severe for bricklayers and tile setters, and for plasterers. Cement and concrete finishers were also substantially affected. Carpenters, painters, other construction workers, and unskilled workers suffered about the same degree of seasonal unemployment. Plumbers and steam fitters fared the best of any of the occupational groups.

In the Atlantic region the impact of seasonal employment fluctuations was somewhat higher for the skilled occupations, and lower for unskilled occupations than for the national average. Seasonal variation in that area affected the carpenters in particular. For Quebec the seasonality ratios were higher than the Canadian averages in almost every construction occupation. Seasonal variations in Ontario were less for skilled and for unskilled occupations as a whole, although slight variations occurred for individual groups. The ratios for the Prairies revealed that this area was the real trouble spot. For every occupation listed, employment fluctuations were indicated to be substantially greater than for other parts of Canada. In contrast, the Pacific region revealed the lowest seasonality ratios for all occupations.

The problem of seasonal unemployment has not been ignored by government and other responsible agencies. In 1954, the Economics and Research Branch of the Department of Labour, co-operating with the National Employment Committee of the Unemployment Insurance Commission, at the request of the National Advisory Council on Manpower, prepared a survey of the seasonal industries in Canada, outlining the causes of seasonal unemployment, its magnitude and trends, and possible remedies for the industries affected. It discussed the construction industry under three classifications: general contractors, building and structures; general contractors, highways, bridges and streets; and special trade contractors.

The general contractors in the buildings and structures group, were found to employ 28% more workers at the peak period of the year than at the slackest period. This is based upon the experience from 1947 to 1951. The ratios for all provinces except Ontario, were found to be higher than the national average, although British Columbia's ratio is only slightly higher. General contractors in this category who were questioned estimated seasonal increases to be from 10% to 500% of minimum employment. Although very few shut down completely for part of the year, more than one-third had seasonal increases of more than 100%. Generally speaking, the smaller companies had larger relative fluctuations than did the bigger companies.

The fluctuations in employment figures of the general contractors in the highways, bridges and street group are considerably greater. At

the peak (again the years 1947 to 1951 were used) they employed 92% more men than at their lowest period of activity. The ratios in Ontario, Alberta, and British Columbia are less than the national average, and those in other provinces are greater. Seasonal increases in employment were reported by the contractors in the highway group to be from 10% to over 500% of minimum figures, and several contractors closed up entirely in winter. Moreover, two-thirds of these contractors reported seasonal increases of more than 100%. In this case, the size of the firm did not relate to the size of employment fluctuations.

Although no estimate could be made of the fluctuations in employment of the special trade contractors group, about one-sixth of those replying to the survey said they had no seasonal increases in employment. Others reported seasonal increases ranging up to 100% of their minimum employment.

To further establish the relative impact of seasonality upon the different construction fields, a number of firms were asked in a questionnaire: "Can you do any work in the wintertime? If so, what kind?" The replies indicated that residential contractors were generally restricted to interior work, except on the Pacific coast where winter conditions are not so difficult. Those firms engaged in non-residential and general building construction replied that operations could be carried on in winter, with very few exceptions, although costs would be affected.

Road builders, on the other hand, were for the most part restricted to clearing, tunnelling, and rock work. Firms doing power, communication and transportation construction were divided; about half carried on work as usual while the other half restricted themselves to quarrying, rock work and blasting. The gas and oil construction firms carried on very limited work in winter. Those firms doing general construction work were able to do building work, bridge and dam work, clearing, coal stripping, tunnelling and in a number of cases, all types of work. In summary, the types of work most severely affected, as would be expected, appear to be some types of excavation, cement and foundation work, stuccoing, outdoor painting, and backfilling. In the cases of jobs which are not directly dependent upon favourable weather conditions, there is an indirect dependency, of course, since work must proceed in a certain order.

Costs, above all, are affected, and there seems a wide divergence of opinion among those in the industry as to how great is the effect. A National Employment Committee studying the problem noted that costs in winter averaged about 10% higher than in summer, with individual types of work affected to a greater or lesser degree. The replies of contractors, grouped as to type of work, diverged widely as well. Residential builders estimated costs from 1% to more than 10% higher, and non-residential builders, from 1% to 50% higher, with most of the replies ranging about the 10% mark. General building contractors estimated

costs from 1% to 20% higher, although the greatest number of estimates ran from 1% to 5%. Contractors doing all types of work replied that wintertime costs were some 5% to 50% higher, and the average reply was about 20%. Road builders estimated costs at anywhere from 10% to 300% higher, depending upon conditions. Firms engaged in power, communication and transportation construction placed costs from 8% to 100% higher in winter, and those in gas and oil construction, 30% to 100% higher.

From the foregoing it will be realized that no simple ratio can express the increment in costs due to winter conditions; rather it would depend entirely upon the type of work undertaken and the conditions met. Actually, it is doubtful whether any type of construction is physically impossible in winter, but some types are certainly not economically feasible, as the above replies indicate. Where individual contractors made exceedingly high estimates as to the percentages by which winter costs might exceed summer costs, it is likely that they made insufficient allowance for the possible economies of proper "timing" of winter work. Thus, while some winter costs would be prohibitive, others do not differ significantly from summer costs.

The relative severity of the problem of unemployment resulting from seasonal variations in the level of activity is decreasing in the long run. It has been pointed out elsewhere that from 1924 to 1928 the amplitude of seasonable employment variations in construction was about 66%; in the years 1947 to 1951 it had dropped to about 38%, while in the last five years it was 37%. However, in terms of absolute numbers of people periodically idle, the problem has grown with the industry's expansion.

Measures to Combat Seasonal Unemployment

In 1952 an interdepartmental committee on unemployment was set up to consider how the federal government might best deal with the problem. This committee reviewed the problem and proposed that certain steps be taken and, subsequently, the cabinet sent a directive to all departments with the object of creating the maximum amount of work during winter months by federal expenditures on construction. The directive had four objectives: timing work on buildings and other public projects to create maximum winter employment; carrying out, as far as practicable, all alterations, repairs and maintenance in winter; endeavouring to schedule more procurement in winter months, even where the supplier's industry is not seasonal, in order that the general level of employment will rise; and designation of one official responsible in each department and agency for giving effect to the directive, and for maintaining contact with the Department of Labour and Treasury Board office. Recently, several contracts have been let by federal government departments specifying that certain amounts of work must be done in winter.

The Division of Building Research of the National Research Council has undertaken studies of wintertime construction and a technical bulletin was made available to the industry in which great stress is laid upon planning as a means of offsetting inclement weather.

Early in 1955 a series of broadcasts over a network of 61 radio stations presented to the public some of the facts regarding wintertime construction. These talks were directed primarily at making the public aware that winter unemployment in the construction trades was to some degree a result of habit and not climate. It was emphasized that a great deal of indoor repair and maintenance work undertaken during the warmer months could as readily be done in winter and that proper planning could facilitate a great deal of outdoor work in winter. It was held that the problem of higher costs is not encountered in all work, owing to better deliveries, lower wages and slightly lower costs of materials, and at times work may even be cheaper.

In 1955 a National Joint Committee was established, sponsored by the Canadian Construction Association. The committee has representatives of labour groups, and of professional and employer groups. Its main object will be to overcome the public preference for good-weather construction.

Five provinces — Ontario, New Brunswick, Nova Scotia, Saskatchewan and Alberta — have set up committees to organize necessary provincial government construction according to a schedule which will provide winter work. In this connection, the New Brunswick Cabinet has authorized winter construction where costs are no more than 10% above the level of summer costs. On the local level, a large number of committees, sponsored by the National Employment Service, have been carrying on an active publicity campaign.

Some of the climatic effects contributing to winter unemployment are being overcome through introduction of new methods and materials, such as cement additives and polythene film for enclosing buildings against the weather. Aside from the cost problem, there are only a few operations which remain physically impossible in winter: outdoor painting and back filling, and some excavation.

A number of large construction firms were asked what new arrangements, if any, would enable them to do more winter work. In their replies, the firms suggested a number of different methods. One residential builder suggested that more winter work could be done if the public would have indoor work done in the winter, rather than the summer. General contracting firms raised the possibility of a government subsidy for winter work, and suggested early calls for tenders to enable buildings to be enclosed by the time the inclement weather began and the calling of tenders during the winter to permit work to begin early in the spring.

Several of these general builders claimed that if the extra costs would be accepted by the customer, work could be readily done in the winter. It should, however, be noted that the savings of overhead costs, benefits from holding together a skilled labour force, the better prices and availabilities of labour and materials should in many cases provide incentive for increased winter construction without raising prices to consumers, particularly if plans are made well in advance. Suggestions from road builders included early calls for tenders, public works programmes, in winter, allowance of extra costs in winter, and one firm, located in British Columbia, suggested letting out rockwork and contracts in the southern part of the province during the winter.

Recruiting and Immigration

For Canada as a whole, the 1951 census indicated that 8.4% of the active male labour force, and 0.5% of the active female labour force, including native born and immigrant workers, were employed by the construction industry. Of the females, almost all were in clerical occupations.

Comparison of the age distribution of the construction labour force with the age distribution of the total male labour force in each of the provinces indicates some variation in the rate of recruitment of construction workers for the different age groups among the provinces. Table 18 shows the percentage of males in each age group employed in construction occupations in 1951. In all provinces the percentages of male workers in construction occupations in the age groups under 20 and 20-24 are less than the corresponding percentages for all age groups together. (For example, 8.1% of all male workers in Newfoundland were employed in construction occupations in 1951, but only 1.6% of those under 20 were employed in construction occupations.) The same holds true for the age group 25-34 in most of the provinces. Conversely, the provincial percentages of male workers in the age groups 35-44 and 45-64 employed in construction occupations are higher than the corresponding percentages for all ages. The same applies in most provinces to the aged 65 or more group. In general, the proportion of male workers in construction occupations over 35 years of age is greater than it is for all occupations in Canada. This means either that construction occupations held a greater appeal for the older worker or that the rate of recruitment of younger men was low. It is suggested that the latter is the more important factor.

The construction occupations with the highest proportions of their numbers in the under 35 age group were the electricians and wiremen, and the plasterers and lathers. Table 19 shows that in 1951 the percentages of those employed in these occupations who were under 35 were 9.3 and 8.8 points higher, respectively, than the percentage of male workers in all occupations who were under 35. Relatively high proportions of young

men were also found among construction machinery operators, brick and stone masons, other construction workers, plumbers and pipe fitters and structural iron workers. Generally speaking, the occupational groups which seemed to hold the most attraction for the younger men accounted for only about one-third of the workers in construction occupations, or about 107,000 workers.

Occupations containing the most substantial proportions of men in the 35 to 64 age group were foremen, owners and inspectors. The requirements of experience on the job, supplemental to training, explains the high proportions in the middle ages, and in the 65 and over category, for these managerial classes. They numbered over 35,000 workers, or about 11% of the construction labour force. The balance of construction workers were also in trades that had a smaller proportion of young men than the male labour force as a whole.

We turn now to the relative importance of the native born and the immigrant worker in construction occupations. Table 20 gives the distribution by place of birth for male construction workers by type of occupation in 1951. At that time about 78% of the workers in construction occupations were native born. Workers from European countries amounted to 10.3% of construction workers, while 8.9% came from the United Kingdom. Less than 3% of the construction workers were from the United States, while construction workers from Asia were almost non-existent.

On the whole, in 1951, there was a larger proportion of immigrant workers in construction occupations than in the male labour force in general. Although it appears that the cement and concrete worker group and brick and stone masons have depended more heavily upon immigration as a source for their labour force, this does not mean that these two occupations have offered the greatest opportunities for the immigrant to Canada who has wished to enter a construction occupation. As Table 21 clearly shows, by far the largest proportions of immigrants entering construction occupations have entered those groups which have been found to be numerically largest. In the long run, immigrants in construction occupations have distributed themselves in a pattern closely resembling that for all workers in construction occupations.

Table 22 indicates the scale of the movement of construction workers into the country since 1939. Of the skilled workers entering the country in the postwar period it is clear that carpenters have maintained their preeminent position for immigrant construction labour. The painters and plasterers group, which together with glaziers had formed the second most important occupation for immigrant construction workers in 1951, was exceeded in size by the number of bricklayers and masons and by the number of electricians entering the country.

Table 23 indicates that over three-quarters of the male construction labour force in Canada in 1951 were native born. Throughout the provinces the proportion of native born construction workers ranged from a low of about 60% in British Columbia and Alberta to over 95% in each of the Atlantic provinces, and 93.2% in Quebec.

Skills, Experience, Training

As the construction industry retains a high degree of "handicraft" aspects of performance, the quality of training of workmen in construction occupations is translated directly into the calibre of the construction work which is performed. Construction occupations vary widely in the degree of skill required, and the training which is necessary to master these skills. Unskilled workers may have little or no training in construction activities. The more specialized tradesmen, however — plumbers, plasterers, carpenters, brick and stone masons, electricians, cement finishers, iron workers, and so on — if properly qualified, ordinarily spend four to five years, or at least 4,000 hours, learning their skills, primarily by undertaking to become apprentices to qualified workmen.

The apprentice is required to be paid a percentage of the journeyman rate, according to the year of apprenticeship. These minimum payment requirements vary with occupation and province. But taking a very rough average, the proportion of journeymen's wages paid to apprentices appears to be about 30% during the first year, and 45%, 60% and 75% during the second, third, and fourth years respectively, in a four-year course. The apprentice is sometimes paid more than the minimum percentage permitted.

The permitted ratio of apprentices to journeymen is controlled largely by the unions, and this ratio also varies from occupation to occupation and from province to province. In recent years, to meet the increased needs of the industry, the permitted proportion of apprentices to journeymen has been raised, so that now an average of about one apprentice to three journeymen is permitted. The actual proportion of apprentices to journeymen is below, sometimes considerably below, the permitted proportion in some construction occupations and for certain localities; but in Quebec and in eastern Canada generally, the permitted and actual ratios of apprentices to journeymen have risen in some occupations to as high as one to one, reflecting the persisting shortage of skilled workers, in spite of the supplemental supply of tradesmen provided by immigration since the war.

The apprenticeship system of training for construction trades is based on indenture to a firm or local apprenticeship committee. Conditions and terms of apprenticeship vary, each province having its own Apprenticeship Act providing for the appointment of a Director of Apprenticeship with necessary staff to register apprentices, supervise their training and collaborate with educational authorities regarding technical training. The Director of Apprenticeship has power to reject any application which does

not appear to be for the benefit of the apprentice. He also registers transfers. Provincial Apprentice Boards, with equal representation by employers and workers as well as representatives from provincial Departments of Labour and Education, are provided for in the Apprenticeship Acts of all provinces but Ontario and Quebec, and serve to advise the Minister or Director of Apprenticeship. The duties of these bodies generally include prescription of the form of indenture; approval, registration or cancellation of indentures; issue of certificates; payment of fees; nature of class training of apprentices; arrangements for trade tests and exams; etc. Trade advisory committees have been established in all provinces, providing for equal representations of employers and workers and in some cases for representatives of the Departments of Education and Labour. The Director of Apprenticeship usually serves as Secretary in these trade advisory committees.

While measures to encourage apprenticeship in construction trades have been adopted in all provinces in recent years, steps taken in the province of Quebec have been outstanding. In that province seven building trades' commissions have been formed under the Apprentice Assistance Act and full-time training centres have been functioning under their supervision, in Montreal, Quebec City, Hull, Sherbrooke and Chicoutimi. In eight other provinces and in many municipalities similar measures have been introduced. Special training is available at high school level, in evening courses, and from vocational institutions which offer more advanced and specialized training. The University of Toronto has completed its second construction management course and the Nova Scotia Technical College is considering offering an undergraduate course in building construction. A training programme for instructors in construction courses was conducted last year by the federal Department of Labour. The activities of the training courses and schools have been highly commended by members of the construction industry. There are indications that extension of such facilities on a wider scale throughout Canada could improve training facilities significantly and contribute to a higher standard of construction performance.

Although the introduction of special training courses was originally an emergency measure, there is every indication that they may be here to stay. There are two reasons why this may be so. In the first place, construction firms are finding the maintenance of long-term apprenticeship programmes increasingly expensive and impractical. Under existing conditions of high mobility of labour there is always the likelihood that the apprentice, upon completion of his training, may move to another firm for higher wages, thus negating the investment in his training by the firm sponsoring his apprenticeship. Secondly, rapid changes in technology will require more from the skilled tradesman than that he be thoroughly conversant with the tried and true methods of the past generation. This will make necessary an increasing concentration upon new developments and new methods which are most easily taught in the classroom and the laboratory. Already these

considerations are reflected in increasing demands for institutional programmes of instruction based on curricula which are standardized throughout Canada and which lead to nationally accredited certificates of competence. It seems likely that the trend toward institutional training will gain rather than lose ground in future years, with a balance eventually becoming established which will combine formal instruction with the best features of the apprenticeship system.

Data on apprenticeship training in construction trades for the years 1946 to 1954 are summarized in Table 24. For each succeeding year from 1950 to 1954 the number of apprentices in training in each of the construction trades remained fairly constant, with a slight rise noticeable in each of the trades, from 1953 to 1954. This would tend to suggest that the number of graduates in each trade would remain fairly constant for a few years following 1954, with the possibility of an upward trend in sight.

The number of graduates in each trade for each year from 1946 to 1954, as a percentage of the total number of workers in that trade for all industries, in 1951, is shown in Table 25.

The number of apprentices in training over the past few years, and the number of graduates, is considered by informed persons in the construction industry and by apprentice-training officials, to have been not great enough. It would appear that the maintenance of an adequate supply of tradesmen in the future will depend on a continuing high level of immigration of skilled and semi-skilled labourers.

It is particularly in relation to the stepped-up needs of the industry that there is a pervading requirement for qualified craftsmen. Where shortages have developed in certain areas, and especially in territories where there is little organized union activity, a considerable amount of tradesmen's work has been undertaken by unskilled labour. Continued dearth in the future is threatened by the tendency for young apprentices to desert the long and poorly paid period of apprenticeship for better paid factory jobs.

Labour Requirements of the Industry

Workers in construction occupations, of course, provide the backbone of the industry's labour force. These include foremen, inspectors, brick and stone masons, carpenters, cement and concrete finishers, construction machinery operators, electricians and wiremen, painters, decorators and glaziers, plasterers and lathers, plumbers and pipe fitters, structural iron workers, and workers in other construction occupations. (See Table 26 for a detailed list.)

Persons classified as labourers in construction were actually engaged in a variety of jobs. Among these the census lists maintenance men, mortar makers and mixers, pavers, pin pullers, pipe cutters, plasterer's helpers and

tenders, plumber's helpers, road builders and graders, rockmen and stone breakers, roofer's helpers, sand hogs, scoop dumpers and fillers. slip fillers, slopemen, snaggers in metalworking, tampers, tar boilers and heaters, trench diggers, wall steamers, well diggers, wire workers, and other workmen in similar unskilled jobs.

According to the census, there was one labourer for every two to three workers in construction occupations in the industry. This ratio varies with the amount of work put into place, the type of structure erected, and the degree of reliance upon sub-contracting arrangements. In general, the proportion of unskilled to skilled workers is smaller for inside than for outside work. For this reason the proportion of unskilled labour tends to be greater for highway, road and engineering construction than for building construction. However, as noted earlier, some general contractors find it an advantage to maintain at least some of the trade skills on their own payrolls to ensure a supply especially suited to their requirements. This may be easier for a large firm to accomplish, especially when it is assured of a substantial volume of year-round business. On the other hand, firms completing projects which are widely dispersed geographically may find it more convenient and economical to rely heavily upon sub-contract labour where reliable trade contractors are readily available. The traditional attitude of management toward "letting out" work may also affect the situation, especially where a long standing history of service has been established or where close ties are maintained to the mutual advantage of the general contractor and the trade contractors. One case was reported where the general contractor owned all the sub-contracting firms used in its work.

Certain differences exist in the requirements for construction workers employed by firms erecting buildings and structures and firms engaged in engineering construction and road building. In general, it can be said that firms in building construction (residential and non-residential) lean most heavily on work completed by tradesmen such as carpenters, painters, bricklayers, plumbers, plasterers, electricians, sheet metal workers, and labourers; heavy construction draws most of its workers from the ranks of engineers, mechanics, machine operators and unskilled labour. Data are not at hand to illustrate the distribution of labour requirements for all kinds of construction, but estimates for the distribution of man-hour requirements, and expenditures on construction labour, by types used in residential completions, are given in Table 27.

Types of workers employed by the construction industry, other than the workers in construction occupations and labourers, are of less importance percentagewise to the industry, but their real significance does not necessarily correspond with their numbers. This is especially true for the proprietary, managerial and professional groups who have been in short

supply in recent years because the rapid growth of construction activity has not allowed time to prepare enough men for responsible positions. Not only has the number of firms, and consequently the number of openings for such men, increased, but the size of construction undertakings has expanded greatly, resulting in a dearth of top-level executives capable of supervising such large projects. Consequently, the industry is faced with the alternative of promoting inexperienced men to the top posts, or of importing suitable executives from the United States and other countries.

Wages and Hours of Work

Average hourly earnings and average weekly wages for the construction industry have shown greater increases between 1949 and 1954 than have occurred in mining, manufacturing, electric and motor transportation, service industry or any of the components of these major industrial groups, as Table 28, indicates. The increase amounted to 46.5% in the level of hourly earnings and to 48.7% in weekly wages.

The differing rates of growth in weekly wages for the two sectors of the construction industry shown in Table 28 reflect changes in the number of hours per work week, as noted in Table 29. The differences between the sectors may also be due to differences in the composition of their labour force. While all forms of construction work depend heavily upon unskilled labour, especially during peak periods of seasonal activity, it is likely that highway, bridge and street construction reflects this tendency most strongly. As unskilled labour is less well paid than skilled labour, it follows that the average hourly earnings for construction workers is likely to be depressed according to the proportionate contribution of unskilled workers to the labour force.

Table 30 indicates the hourly earnings in 11 Canadian cities, as well as the average for these cities, for eight leading construction trades, in 1954, 1955 and 1956. It will be seen that regional differences in wage rates are quite pronounced. Averages of the rates for the eight trades are listed in Table 31.

Census information provides further confirmation of the existence of geographical differentials in the wage structure for workers in construction occupations. Table 32, gives the distribution of male construction workers in fifteen cities, by annual earnings. There is some suggestion that a reduction in the differentials of the wage structure for construction occupations may be under way, in view of the fact that the most substantial percentage increases in wages have consistently applied to the lowest wage rates. Indexes published by the Central Mortgage and Housing Corporation indicate that over the period 1949 to 1955 the most substantial percentage increases in hourly wage rates have ranked in the following order: unskilled workers, up 46.7%; electricians, up 45.7%;

sheet metal workers, up 44.3%; carpenters, up 42.4%; truck drivers, up 41.9%; painters, up 41.2%; plumbers, up 37.6%; and bricklayers, up 32.2%.

We find that bricklayers, who were receiving the highest level of wages in 1955 (Table 30), have received the smallest proportional increase in hourly earnings over the period; unskilled labour, on the contrary, was receiving the lowest hourly wages rate but obtained the largest percentage hourly wage increase over the 1949-55 period. Plumbers were near the top of the wage scale and received the second smallest wage increase. Electricians, sheet metal workers and carpenters were above average both in terms of their 1955 hourly wage rate (ranging around $2 an hour) and in terms of the increases they received. Increases in hourly wage rates for all construction workers were substantially greater than increases in hourly wage rates for all industries together, especially since 1951. Both were very much greater than increases in the consumer price index. Over the period 1949 to 1954 the consumer price index increased 16.4%; over-all increases in the level of industrial wage rates were 37.9%, and hourly wage rates for construction workers rose 41.2%.

Labour Organization

In October, 1954, just under two-thirds of all paid workers in the construction industry were covered by labour agreements. This compares favourably with the corresponding percentages, shown in Table 33, for other major industries in Canada. As these percentages include all workers affected by agreements, whether union or non-union, they exceed the proportion of union membership. In 1955 there were approximately 109,400 workers in the construction industry who were also union members. Since total employment in the industry in 1955 was 357,000, more than 30% of employees in the industry were unionized. Total union membership in all industries in Canada in 1955 was 1,150,000 so that the construction industry accounted for close to 10% of all union members.

The extent of trade union membership, and the number of union branches in the construction industry in Canada, for the years 1951 and 1955, are indicated in Table 34. Table 35 gives the provincial distribution in 1955. The data in these tables underestimate the extent of organization in the construction industry because industrial and regional breakdowns of union membership can only be obtained from reports received from the local unions, and a few local unions failed to respond to the Department of Labour's survey. The pattern of regional membership is influenced, of course, by the distribution of construction employment, which has been shown to be heaviest in the built-up areas of Ontario and Quebec. In

these areas common union councils for all construction trades have taken shape, which have strengthened union membership considerably.

Information regarding membership by type of union — international, national, and regional, directly chartered and unaffiliated local unions — cannot be obtained on a basis strictly comparable with the data in Tables 34 and 35. However, Tables 36 and 37 present information for unions, the majority of whose membership is employed in the construction industry. The International Brotherhood of Electrical Workers is included because they have a substantial number of members in the industry.

Organized workers in the construction industry in 1955 were predominantly members of international unions. Fifteen of a total of 16 unions were international in scope, the sixteenth being affiliated with the *Confédération des Travailleurs Catholiques du Canada*. The branches and membership of all construction unions are listed in Table 38.

The unions tend to be strongest where the firm is large, and consequently employees are less completely organized in residential construction than in other types of construction. However, pronounced craft traditions are also a very important factor in union organization and this explains why organization of the sub-trades vital to house building is almost complete. The degree of union membership is affected by the attitude of the firm toward organization of its employees, which is often more favourable in large firms which find it convenient to bargain with a single representative unit. Where management is anti-union in outlook it may nevertheless be forced to hire union labour to meet its labour requirements. Smaller firms are in a better position to hire non-union men if they wish, in view of their more limited demand for workers.

An important function of the unions is to maintain craft standards and to supply qualified labour. They often complement the work of the Unemployment Insurance Commission in placing unemployed craftsmen in jobs. On the other hand they also exercise regulatory powers over such craftsmen, forbidding them from working at other construction trades for which they are not specifically qualified. However, such prohibitions do not prevent tradesmen from accepting temporary employment outside the construction field. It should be noted, also, that despite marked improvements in working conditions and labour relations, there is still a considerable amount of time lost through strikes in the industry, as shown in Table 39.

Collective Bargaining

Collective bargaining in the construction industry is generally done on the basis of area rather than employer. However, almost any statement

regarding collective bargaining must be qualified by the word "generally", since there is no uniform practice. Any attempt to be all-inclusive in setting forth practices is precluded by the multiplicity of contracts and agreements. A negotiated contract applies to the contractors within a given area and the principals to such a contract are generally the Builders' Exchanges, representing the local contractors, on the one hand, and the unions, representing the tradesmen, on the other. In some cases, particularly in the Province of Quebec, and elsewhere on very large jobs there may be several locals but only one contract. In a number of cases, too, one contract may cover a number of trades, so that there is but one bargaining session and thus less possibility of some trades being forced into idleness while a contract is being negotiated. Contracts are frequently negotiated annually, but two-year contracts are now not at all uncommon in some larger cities, although there are few contracts that run any longer than two years.

In the Province of Quebec, an agreement negotiated between the unions and the employer organizations becomes law and applies to everyone in the trades. The agreement, upon becoming a decree, is policed to ensure enforcement within the prescribed area.

The improvement of working conditions and the increase of wages in the construction industry owe much to the effectiveness of collective agreements, as well as to union organization. The eight-hour day has become general; the recognized basis of payment is time, with time and a half or time and three-quarters for overtime; and other benefits, such as vacation with pay, have become established. Welfare and working facilities are regulated provincially or by collective agreement. The terms of any agreement vary, of course, but the items usually include territorial jurisdiction, wage rates and hours of work; transportation to and from work, usually for out-of-town jobs; vacation with pay, holidays, disallowance of piece rates; jurisdiction of work; and regulation of ages, period of training, examination and pay of apprentices.

A sample survey of 75 collective agreements affecting workers in the construction industry in 30 cities in Canada revealed that three contained provisions relating to a welfare fund and 41 contained provisions regarding welfare facilities at the site, ranging from the supply of sanitary utensils for drinking water and the supply of water, to the supply of lockfast shelters for changing clothes; from the supply of tool chests, the provision of lunch rooms, sanitary facilities, and so on, to the provision of protective clothing and wash-up time. These provisions and other regulations arrived at through collective agreement, while the direct result of union activity, apply to all workers, whether or not they are union members.

Appendix: The Various Estimates of Construction Employment

The limitations of Unemployment Insurance data and the Dominion Bureau of Statistics data on employment and payrolls are indicated by the footnotes to Table 2. Both series have restricted coverage, the former being confined to a sample of insurable persons, the latter relating only to firms hiring 15 or more persons. Both exclude proprietors and owner-managers. The estimated industrial coverage of the construction industry by the employment and payrolls survey, which yields higher figures for employment than the unemployment insurance count, was 81% at June 1, 1951. Therefore, both these series understate the amount of employment in the construction industry.

The estimates for paid workers derived from the labour force sample and the census probably are more representative. These sources also give a useful compilation of the number of persons who work as self-employed tradesmen, and the number of employers and unpaid family workers. Taken along with the number of paid workers, this provides an estimate for all status workers, in both the construction industry and in construction occupations. Based on the census, full-time employment in the construction industry in 1951 was 286,561 for paid workers, and 350,896 for all status workers. There are no census data for 1954, of course, but labour force estimates for July (near the seasonal peak of construction activity) of that year indicate that about 374,000 persons (all status) were employed in the construction industry. Data for all status workers in the construction industry at July 23, 1955, indicated that approximately 421,000 persons were then working in the industry. By June 23, 1956, this figure had risen to 467,000. Table 40 gives estimates from the labour force survey of the number of persons in the construction industry, for all status and for paid workers, over the years 1946 to 1956.

The estimates of employment by contractors and others in the construction reports published by the Dominion Bureau of Statistics indicate the average number of workers on the payroll throughout the year. Estimates are available for paid workers hired by contractors, which can be regarded as an industry estimate, and for construction workers employed by utilities, governments, and other organizations. The total estimate of employment in construction occupations reflects an upward bias when compared with estimates of full-time construction workers available from the other sources. This is because the number of workers in occupations other than construction who are employed by contractors is not deducted from the estimated number of total workers in construction occupations.

In addition, the method of collecting the data, based on monthly payroll reports, may accidentally include persons not employed for the full month, although this is probably not an important source of upward bias. Respondents in 1951 were advised that one method of computing average

monthly employment was to divide the number of working days in the month into the total number of man-days worked by all employees in the month. In 1954, the respondents were asked to report the total number on the payroll during the last pay period of the month. For both methods, the annual average was computed by D.B.S. by summing the monthly averages of all reporting firms and dividing by 12.

Table 41 gives the estimates of construction employment by contractors, utilities, governments, and others, over the five years from 1951. Utilities and governments account for, by far, the bulk of all those engaged in construction work outside the industry.

Statistical Tables

Table 1

OCCUPATIONAL DISTRIBUTION OF WORKERS IN THE CONSTRUCTION INDUSTRY[a] IN 1951

Occupations	Number of Workers		Total	
	Male	Female	Number	Percentage
All occupations[b]	344,889	6,007	350,896	100.0
Construction	195,302	151	195,453	55.7
Labourers	72,993	169	73,162	20.9
Proprietary and managerial	22,624	133	22,757	6.5
Transportation	16,840	19	16,859	4.8
Manufacturing and mechanical	12,862	68	12,930	3.7
Clerical	6,462	4,613	11,075	3.2
Professional	5,670	84	5,754	1.6
Electric light and power	4,371	—	4,371	1.2
Service[c]	3,057	511	3,568	1.0
Mining and quarrying	1,840	—	1,840	0.5
Commercial	1,353	66	1,419	0.4
Communication	635	94	729	0.2
Logging	247	—	247	0.1
Agricultural	210	—	210	0.1
Financial	14	—	14	—
Fishing, hunting and trapping	1	—	1	—

a Yukon and Northwest Territories not included.

b Includes persons not reporting occupations.

c Includes personal, protective and other services. Professional services are not included.

SOURCE: *Census of Canada, 1951*, Vol. IV, Table 15.

EMPLOYMENT IN THE CONSTRUCTION INDUSTRY AND IN CONSTRUCTION OCCUPATIONS, ACCORDING TO VARIOUS ESTIMATES, FOR 1951, 1954 AND 1955

Source of Estimates	1955	1954		1951	
		Persons in		Persons in	
	Industry	Industry	Occupations	Industry	Occupations
Unemployment insurance survey[a]	n.a.	181,980	184,780	172,380	155,120
Employment and payrolls survey[b]	231,288	223,592	—	223,290	—
Labour force survey[c]:					
All status groups	421,000[g]	374,000	313,000	353,000	323,000
Paid workers	357,000[g]	304,000	276,000	279,000	267,000[f]
Construction survey[d]	366,743	316,191	512,852	286,170	467,524
Census[e]:					
All status groups	—	—	—	350,896	299,611
Paid workers	—	—	—	286,561	251,942

a Based on a 10% sample of the insured population during the month of April.

b Based on surveys of firms with staffs of 15 and over, monthly averages.

c Based on a sample during the month of June.

d Based on replies from firms and individuals paying for construction work performed from which estimates of the average number of monthly employees during the year are computed by D.B.S.

e Month of June. (Cf. Vol. IV, Tables 11 and 19.)

f Month of November. Data not available for June.

g At July 23.

SOURCE: See appendix to Chapter 5.

Table 3

PERCENTAGE OF MALE LABOUR FORCE IN CONSTRUCTION OCCUPATIONS AT DECENNIAL CENSUSES

1901-51[a]

Year	Canada[b]	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
1951	7.89	5.75	7.99	6.69	8.71	8.32	7.08	3.44	6.96	8.61
1941	6.32	4.15	7.56	5.33	7.54	6.78	5.70	2.14	3.50	7.57
1931	6.23	3.59	5.75	4.70	7.66	6.99	5.63	2.59	3.42	7.24
1921	6.06	3.56	6.74	4.91	6.99	6.95	5.29	2.53	3.20	7.24
1911	6.38	3.35	4.99	4.42	6.35	6.43	7.13	4.83	6.43	9.81
1901	5.77	—	—	—	—	—	—	—	—	—

a Occupations for 1901, 1911, 1941 and 1951 were rearranged on the basis of the 1931 Census classification (although some adjustment of the 1931 grouping was also made). This rearrangement is apparently the reason for discrepancies in some of the 1951 percentages between this table and Table 18, which is based on the 1951 Census classification.

b Excludes Newfoundland, Yukon and Northwest Territories.

SOURCE: *Census of Canada, 1951*, Vol. IV, Table 2.

Table 4

PERCENTAGE DISTRIBUTIONS OF CONSTRUCTION EMPLOYMENT AND OF VALUE OF CONSTRUCTION WORK PERFORMED BY PROVINCES, FOR THE PERIOD 1951-54

Province	Employment	Value of construction	Employment—value differential
Canada	100.0	100.0	
Newfoundland	1.8	1.5	−0.3
Prince Edward Island	0.4	0.3	−0.1
Nova Scotia	3.8	2.9	−0.9
New Brunswick	3.1	2.3	−0.8
Quebec	27.0	24.5	−2.5
Ontario	34.2	35.7	−1.5
Manitoba	5.4	5.0	−0.4
Saskatchewan	4.9	5.0	−0.1
Alberta	9.6	11.3	−1.7
British Columbia	9.8	11.4	−1.6

SOURCE: Computed from data in D.B.S., *Construction in Canada, 1953-1955*.

Table 5

RURAL AND URBAN DISTRIBUTION[a] OF PERSONS WORKING IN THE CONSTRUCTION INDUSTRY, FOR CANADA AND THE PROVINCES[b], 1951

Province	Rural				Urban		Total number of workers in the construction industry[c]
	Non-farm		All rural		Number	Percentage of total	
	Number	Percentage of rural	Number	Percentage of total			
Newfoundland	3,523	90.3	3,903	53.5	3,388	46.5	7,291
Prince Edward Island	631	58.7	1,075	57.3	800	42.7	1,875
Nova Scotia	6,208	73.0	8,503	51.9	7,889	48.1	16,392
New Brunswick	3,467	67.4	5,141	50.9	4,954	49.1	10,095
Quebec	18,347	74.9	24,494	23.8	78,209	76.2	102,703
Ontario	24,374	71.3	34,174	26.8	93,320	73.2	127,494
Manitoba	3,494	72.1	4,848	28.4	12,249	71.6	17,097
Saskatchewan	3,378	77.9	4,336	37.5	7,230	62.5	11,566
Alberta	4,224	74.0	5,709	22.2	19,953	77.8	25,662
British Columbia	6,735	79.3	8,496	27.7	22,225	72.3	30,721
Canada	74,381	73.9	100,679	28.7	250,217	71.3	350,896

a Urban population includes all persons residing in cities, towns and villages of 1,000 and over whether incorporated or not, as well as the population of all parts of census metropolitan areas. Farm population includes those persons living on a holding on which agricultural operations were carried out and which was (a) three acres or more in size; or (b) from one to three acres in size with agricultural production in 1950 amounting to $250 or more. Rural non-farm is the residual classification.

b Excluding Yukon and Northwest Territories.

c Excludes a few persons seeking work who have never been employed.

SOURCE: *Census of Canada, 1951*, Vol. IV, Table 18.

LABOUR FORCE IN THE CONSTRUCTION INDUSTRY BY PROVINCES, 1951[a]

Type of Construction	Canada		Atlantic		Quebec	
	Total	Percentage distribution	Total	Percentage distribution	Total	Percentage distribution
Construction	350,896	100.0	35,653	100.0	102,703	100.0
Buildings and structures	277,562	79.1	24,629	69.1	82,451	80.3
Highways, bridges, street construction	52,433	14.9	9,236	25.9	13,413	13.1
Other construction	12,667	3.6	1,066	3.0	4,434	4.3
All other trades	7,954	2.3	670	1.9	2,288	2.2
Not stated	280	0.1	52	0.1	117	0.1

	Ontario		Prairies		British Columbia	
	Total	Percentage distribution	Total	Percentage distribution	Total	Percentage distribution
Construction	127,494	100.0	54,325	100.0	30,721	100.0
Buildings and structures	104,132	81.7	42,545	78.3	23,805	77.5
Highways, bridges, street construction	16,745	13.1	8,195	15.1	4,844	15.8
Other construction	3,889	3.1	2,069	3.8	1,209	3.9
All other trades	2,692	2.1	1,504	2.8	800	2.6
Not stated	36	—	12	—	63	0.2

a Persons 14 years of age and over, not including Yukon and Northwest Territories. A few persons seeking work who have never been employed are excluded.

SOURCE: *Census of Canada, 1951*, Vol. IV, Table 16.

Table 7

WORKERS IN CONSTRUCTION OCCUPATIONS IN THE CONSTRUCTION INDUSTRY AND IN ALL INDUSTRY, CANADA[a], 1951

Occupation	Construction industry		All industry	
	Number	Percentage	Number	Percentage
Construction occupations	195,419[c]	100.0	299,611	100.0
Carpenters	86,260	44.1	129,045	43.0
Painters, decorators and glaziers	27,000	13.8	47,158	15.7
Plumbers and pipe fitters	18,860	9.7	29,531	9.8
Brick and stone masons	13,723	7.0	15,845	5.3
Electricians and wiremen	13,545	6.9	35,005	11.7
Foremen	10,456	5.4	11,569	3.9
Plasterers and lathers	9,010	4.6	9,270	3.1
Construction machinery operators[b]	6,518	3.3	8,227	2.7
Other construction workers	5,694	2.9	7,560	2.5
Cement and concrete finishers	2,566	1.3	2,946	1.0
Structural iron workers	1,147	0.6	1,838	0.6
Inspectors	640	0.3	1,617	0.5

a Excludes Yukon and Northwest Territories.

b Not elsewhere specified.

c Discrepancy of 34 between this figure and that of 195,453 given as total of construction occupations (shown in Table 1) cannot be accounted for.

NOTE: The order of importance, by size of group, generally follows the same rank for the construction industry as for all industry. The only exception is for electricians and wiremen who, for all industry, are third in group size. Each occupation classification, e.g., "Electricians and wiremen", includes not only journeymen, but also all other members of the labour force, male and female 14 years of age and over, such as apprentices and labourers not qualified as journeymen, who claimed they fell into each occupation classification. The number in each classification may be somewhat overstated in that a respondent to census enquiries may have said he was, e.g., a carpenter, when he was not.

SOURCE: *Census of Canada, 1951*, Vol. IV, Tables 4 and 23.

Table 8

PERCENTAGE OF WORKERS IN CONSTRUCTION OCCUPATIONS EMPLOYED IN THE CONSTRUCTION INDUSTRY, 1951

Plasterers and lathers	97.2
Foremen	90.4
Cement and concrete finishers	87.1
Brick and stone masons	86.6
Construction machinery operators[a]	79.2
Other construction workers	75.3
Carpenters	66.8
Plumbers and pipe fitters	63.9
Structural iron workers	62.4
Painters, decorators and glaziers	57.3
Inspectors	39.6
Electricians and wiremen	38.7
All construction occupations	65.2

a Not specified elsewhere.

SOURCE: Computed from Table 7.

Table 9

VALUE OF CONSTRUCTION WORK PERFORMED, BY PROVINCE, 1951

(percentage distribution)

Canada	100.0
Newfoundland	1.4
Prince Edward Island	0.4
Nova Scotia	2.8
New Brunswick	2.5
Quebec	24.5
Ontario	36.9
Manitoba	5.0
Saskatchewan	4.2
Alberta	10.4
British Columbia	12.0

SOURCE: Computed from data in D.B.S., *Construction in Canada*, 1953-1955.

Table 10

PERCENTAGE DISTRIBUTION, BY PROVINCES, OF WORKERS IN CANADA, 1951

Construction Workers	Canada[a]	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
Total construction	100	2.3	0.6	4.6	2.9
Carpenters	100	3.5	0.7	5.4	3.6
Painters, decorators and glaziers	100	1.5	0.5	4.1	2.6
Electricians and wiremen	100	1.6	0.3	3.8	1.9
Plumbers and pipe fitters	100	1.7	0.4	4.3	2.3
Brick and stone masons	100	0.9	0.3	3.9	2.6
Foremen	100	2.1	0.6	6.9	4.2
Plasterers and lathers	100	0.2	0.2	1.8	0.7
Construction machinery operators[b]	100	1.6	1.3	6.4	4.4
Other	100	1.4	0.2	2.3	1.6
Cement and concrete finishers	100	1.7	0.3	2.6	1.6
Structural iron workers	100	3.1	0.1	4.4	3.8
Inspectors	100	1.1	0.5	5.3	2.6

Construction Workers	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Total construction	30.4	35.6	5.0	2.7	6.3	9.6
Carpenters	30.9	30.3	5.4	3.2	6.9	10.1
Painters, decorators and glaziers	30.6	40.4	5.6	2.3	4.5	7.9
Electricians and wiremen	34.2	39.2	4.2	1.8	3.9	9.1
Plumbers and pipe fitters	34.0	37.0	3.8	1.9	6.3	8.3
Brick and stone masons	31.2	49.0	2.5	1.8	3.6	4.2
Foremen	26.6	33.5	4.4	3.3	7.8	10.6
Plasterers and lathers	27.3	40.4	6.1	2.5	10.5	10.3
Construction machinery operators[b]	11.6	33.7	8.7	5.8	11.6	14.9
Other	24.5	39.5	4.9	2.1	8.5	15.0
Cement and concrete finishers	24.1	41.7	5.2	2.1	9.8	10.9
Structural iron workers	19.9	39.1	4.8	1.5	9.8	13.6
Inspectors	24.1	37.9	7.4	3.0	7.1	11.0

a Excludes Yukon and Northwest Territories. Supplementary data for these areas are given in Vol. IV, Table 5, of the 1951 Census. Total construction workers numbered 410 in the Yukon and 213 in the Northwest Territories. Carpenters formed the largest group in the construction occupations numbering 204 and 123 respectively.

b Not elsewhere specified.

SOURCE: Computed from data in *Census of Canada, 1951*, Vol. IV, Table 4.

WAGE-EARNERS IN THE CONSTRUCTION INDUSTRY IN CITIES OF 100,000 POPULATION AND OVER[a]

(1951)

City	All construction	Buildings and structures	Highways, bridges and street construction	Other construction	All other trades and not specified
Quebec, Que.	7,201	5,720	1,321	45	115
Montreal, Que.	34,691	29,994	3,078	410	1,209
Ottawa, Ont.	6,460	5,886	476	18	80
Toronto, Ont.	28,458	24,750	2,761	189	758
Hamilton, Ont.	5,784	5,048	568	45	123
Windsor, Ont.	3,056	2,750	155	120	31
Winnipeg, Man.	7,795	6,721	682	124	268
Calgary, Alta.	4,770	4,144	456	54	116
Edmonton, Alta.	7,814	6,679	691	279	165
Vancouver, B.C.	11,662	9,313	1,605	351	393
10 Cities	117,691	101,005	11,783	1,635	3,258
Percentage	100	85.8	10.0	1.4	2.8

a Census metropolitan areas.

Source: *Census of Canada, 1951*, Vol. V, Table 25.

Table 12

PERCENTAGE DISTRIBUTION OF THE MALE LABOUR FORCE IN CONSTRUCTION OCCUPATIONS IN 1951, SELECTED LARGER CITIES[a]

Occupation	St. John's, Nfld.	Halifax, N.S.	Saint John, N.B.	Quebec, Que.	Montreal, Que.
Construction	100.0	100.0	100.0	100.0	100.0
Foremen	1.3	4.4	3.6	3.9	3.4
Inspectors	0.9	1.3	0.5	0.6	0.6
Brick and stone masons	4.2	5.3	6.0	5.1	6.8
Carpenters	53.1	36.5	41.2	37.5	32.4
Cement and concrete finishers	0.3	1.4	0.2	0.7	1.3
Construction machinery operators[b]	0.7	1.3	2.4	0.7	0.5
Electricians and wiremen	10.8	14.8	10.1	13.5	14.2
Painters, decorators and glaziers	16.1	16.1	17.7	17.8	20.3
Plasterers and lathers	0.8	2.5	0.2	2.9	4.3
Plumbers and pipe fitters	10.9	13.5	13.1	14.7	13.1
Structural iron workers	0.1	0.7	0.5	0.3	0.4
Other	0.7	2.1	4.6	2.2	2.7

Occupation	Ottawa, Ont.	Toronto, Ont.	Hamilton, Ont.	London, Ont.	Windsor, Ont.
Construction	100.0	100.0	100.0	100.0	100.0
Foremen	4.3	2.7	3.5	3.8	2.3
Inspectors	0.4	0.6	0.5	0.7	0.4
Brick and stone masons	6.3	9.8	10.8	6.0	8.0
Carpenters	28.9	30.4	27.5	32.6	22.8
Cement and concrete finishers	1.0	1.7	1.5	1.2	2.1
Construction machinery operators[b]	1.5	0.9	1.3	1.2	1.0
Electricians and wiremen	13.9	10.9	15.2	14.2	15.1
Painters, decorators and glaziers	19.2	22.8	20.5	23.0	28.7
Plasterers and lathers	6.8	4.8	4.9	4.1	3.5
Plumbers and pipe fitters	13.1	9.9	9.9	9.8	10.9
Structural iron workers	0.5	1.0	1.2	0.6	1.1
Other	4.1	4.6	3.3	2.8	4.0

PERCENTAGE DISTRIBUTION OF THE MALE LABOUR FORCE IN CONSTRUCTION OCCUPATIONS IN 1951

SELECTED LARGER CITIES[a]

Occupation	Winnipeg, Man.	Calgary, Alta.	Edmonton, Alta.	Vancouver, B.C.	Victoria, B.C.
Construction	100.0	100.0	100.0	100.0	100.0
Foremen	3.2	3.7	5.2	4.1	2.0
Inspectors	1.0	0.6	0.9	0.8	0.8
Brick and stone masons	3.3	3.5	3.8	2.9	2.1
Carpenters	37.5	43.9	41.4	38.9	39.4
Cement and concrete finishers	1.7	1.8	2.0	1.6	1.7
Construction machinery operators[b]	2.4	2.5	2.6	1.9	1.9
Electrician and wiremen	10.3	8.7	7.5	11.1	13.6
Painters, decorators and glaziers	24.2	14.2	12.3	18.8	19.4
Plasterers and lathers	5.2	5.6	6.4	4.4	4.6
Plumbers and pipe fitters	7.9	11.6	12.3	9.0	10.0
Structural iron workers	0.4	0.4	1.3	1.1	0.3
Other	3.0	3.5	4.3	5.3	4.4

a Census metropolitan areas.

b Not elsewhere specified.

SOURCE: *Census of Canada, 1951*, Vo'. IV, Table 6.

Table 13

AVERAGE NUMBER OF CONSTRUCTION CONTRACTS, BY MAIN CATEGORIES, AWARDED MONTHLY, 1946-55

Month	Residential	Engineering	Industrial	Business	Total
January	2,122.7	98.8	106.7	461.5	2,789.7
February	2,889.2	167.7	96.3	469.1	3,622.3
March	3,264.8	153.9	104.2	550.9	4,073.8
April	5,500.8	177.0	128.7	730.2	6,536.7
May	7,304.8	209.9	144.6	888.2	8,547.5
June	7,795.9	250.8	148.3	939.7	9,134.7
July	6,910.7	247.0	125.3	855.5	8,138.5
August	6,893.0	227.6	130.9	818.8	8,070.3
September	5,717.4	232.1	127.6	763.5	6,840.6
October	5,669.7	228.1	153.6	834.2	6,885.6
November	5,682.0	250.1	155.9	787.0	6,875.0
December	3,741.2	139.0	115.8	563.9	4,559.9
Total	63,492.2	2,382.0	1,537.9	8,662.5	76,074.6

SOURCE: *MacLean Building Guide*, various issues.

Table 14

PERCENTAGE VARIATION AT PEAK AND TROUGH PERIODS FROM AVERAGE MONTHLY EMPLOYMENT FOR THE YEAR, CANADA AND REGIONS, 1945-50

Year	Canada				Year	Quebec			
	Month	Peak	Month	Trough		Month	Peak	Month	Trough
		Percentage of average yearly employment		Percentage of average yearly employment			Percentage of average yearly employment		Percentage of average yearly employment
1945	October	115.7	February	74.3	1945	September	126.0	January	65.2
1946	August	117.4	February	75.3	1946	August	123.4	February	68.3
1947	August	118.8	January	76.9	1947	August	129.7	January	66.3
1948	July	117.1	February	78.6	1948	July	124.7	February	71.1
1949	August	116.7	February	81.1	1949	July	121.9	February	80.4
1950	August	118.8	January	75.6	1950	August	121.0	January	77.4

Year	Maritimes[a]				Year	Ontario			
	Month	Peak	Month	Trough		Month	Peak	Month	Trough
		Percentage of average yearly employment		Percentage of average yearly employment			Percentage of average yearly employment		Percentage of average yearly employment
1945	October	143.6	February	56.3	1945	November	126.0	February	72.0
1946	October	142.8	March	56.5	1946	August	116.4	February	73.6
1947	August	133.0	February	64.0	1947	October	116.3	February	76.4
1948	September	137.7	March	58.1	1948	July	114.8	January	80.7
1949	August	129.5	February	67.3	1949	August	115.8	February	81.2
1950	August	129.4	March	69.4	1950	November	113.3	February	77.8

Table 14 (cont'd)

PERCENTAGE VARIATION AT PEAK AND TROUGH PERIODS FROM AVERAGE MONTHLY EMPLOYMENT FOR THE YEAR, CANADA AND REGIONS, 1945-50

Year	Prairies				Year	British Columbia			
	Month	Peak	Month	Trough		Month	Peak	Month	Trough
		Percentage of average yearly employment		Percentage of average yearly employment			Percentage of average yearly employment		Percentage of average yearly employment
1945	October	137.0	January	60.8	1945	August	116.0	January	73.7
1946	July	131.0	January	61.0	1946	August	116.8	January	74.7
1947	July	129.7	January	64.7	1947	August	115.4	January	76.6
1948	August	130.4	January	64.9	1948	August	118.6	February	82.4
1949	August	121.4	February	72.9	1949	September	118.5	February	77.9
1950	July	126.0	January	71.6	1950	July	114.6	January	75.7

a Newfoundland not included before 1949; included with Maritimes in 1949 and 1950.

SOURCE: Based on estimates of monthly employment in the construction industry by groups (general and trade contractors, including owner builders, industrial organizations, hydro-electric power and public utilities commissions; steam and electric railways; telephone companies; dominion, provincial and municipal governments). Cf. D.B.S., *The Construction Industry in Canada*, various issues.

Table 15

EXCESS OF UNPLACED APPLICANTS OVER UNFILLED VACANCIES IN CONSTRUCTION INDUSTRY IN CANADA[a], 1945-54

Month	1945			1946		
	Skilled and semi-skilled	Unskilled	Total	Skilled and semi-skilled	Unskilled	Total
January	2,737	(1,003)	1,734	12,323	1,688	14,001
February	3,081	(1,121)	1,960	14,748	1,822	16,570
March	208	(2,339)	(2,131)	12,362	1,090	13,452
April	(4,163)	(4,604)	(8,767)	5,158	(159)	4,999
May	(6,740)	(5,244)	(11,984)	928	(622)	306
June	(7,431)	(4,896)	(12,327)	(605)	(949)	(1,554)
July	(9,766)	(5,272)	(15,038)	(1,037)	(834)	(1,871)
August	(7,508)	(4,272)	(11,780)	(1,259)	(1,430)	(2,689)
September	(5,101)	(3,936)	(9,037)	(1,408)	(2,397)	(3,805)
October	(1,847)	(1,376)	(3,223)	(559)	(3,130)	(3,689)
November	2,604	636	3,240	2,565	(922)	1,643
December	7,421	1,006	8,427	7,965	577	8,542
	1947			1948		
January	13,015	2,005	15,020	16,033	9,592	25,625
February	12,825	8,269	21,094	18,504	10,593	29,097
March	10,045	7,024	17,069	16,114	9,883	25,997
April	6,609	4,227	10,836	9,600	6,050	15,650
May	732	(2,079)	(1,347)	3,180	1,879	5,059
June	(1,872)	(2,378)	(4,250)	156	1,211	1,367
July	(2,741)	(2,891)	(5,632)	(153)	599	446
August	(3,011)	(5,314)	(8,325)	(925)	(832)	(1,757)
September	(2,968)	(7,564)	(10,532)	(468)	(1,740)	(2,208)
October	(1,913)	(4,324)	(6,237)	966	638	1,604
November	3,090	1,636	4,726	5,672[c]	4,494	10,166
December	10,019	6,649	16,668	15,640	10,811	26,451
	1949[b]			1950		
January	26,196	15,616	41,812	41,391	23,775	65,166
February	28,581	16,573	45,154	41,832	24,490	66,322
March	24,634	15,631	40,265	41,707	27,738	69,445
April	16,562	10,294	26,856	29,027	20,419	49,446[c]
May	7,747	4,929	12,676[c]	13,011	8,966	21,977[c]
June	5,309	4,059	9,368	6,374	5,068	11,442[c]
July	4,835	3,790	8,625	3,264	2,645	5,909
August	5,324	2,901	8,225	3,221	2,047	5,268
September	5,300	2,903	8,203	3,024	(582)	2,442
October	8,439	5,963	14,402	4,927	2,168	7,095
November	15,482	10,931	26,413	11,600	7,087	18,687
December	27,417	16,897	44,314	22,345	13,172	35,517

Table 15 (cont'd)

EXCESS OF UNPLACED APPLICANTS OVER UNFILLED VACANCIES IN CONSTRUCTION INDUSTRY IN CANADA[a], 1945-54

Month	1951			1952		
	Skilled and semi-skilled	Unskilled	Total	Skilled and semi-skilled	Unskilled	Total
January	35,330	19,538	54,868	43,167[c]	24,620	67,787[c]
February	36,775	19,623	56,398	45,940	26,949	72,889
March	33,615	18,678	52,293	42,416	27,582	69,998[c]
April	18,538	9,682	28,220	29,224	17,096	46,320
May	7,284	2,736	10,020	14,995[c]	9,668	24,663
June	3,878	2,537	6,415	10,473	7,171	17,644
July	2,818	1,603	4,421	7,523	5,571	13,094
August	2,391	723	3,114	5,771	3,361	9,132
September	2,524	(827)	1,697	4,220	1,936	6,156
October	6,774	3,311	10,085	6,560	4,668	11,228
November	15,472	8,356	23,828	15,214	10,231	25,445
December	28,905	15,753	44,658	35,275	23,704	58,979
	1953			1954		
January	48,336	33,406	81,742	71,735	81,901	153,636
February	50,494	35,528	86,022	73,935	83,919	157,854
March	46,189	34,336	80,525	68,686	81,762	150,448
April	28,196	20,597	48,793	51,916	59,679	111,595
May	13,266	11,217	24,483	26,671	30,974	57,645
June	8,072	9,189	17,261	19,948	25,454	45,402
July	5,936	7,767	13,703	14,966	19,818	34,784
August	5,936	6,780	12,716	13,204	17,765	30,969
September	6,422	7,853	14,275	13,812	16,959	30,771
October	11,121	15,161	26,282	18,156	20,897	39,053
November	27,523	36,413	63,936	30,213	38,308	68,521
December	51,177	61,918	113,095	53,681	63,490	117,171

a These figures represent net workers available in the construction trades. Figures in brackets represent an excess of openings over applicants.

b Newfoundland not included before 1949.

c This figure differs from the one which can be derived from *Housing in Canada*, which appears to be incorrect. The figure used here is the one necessary for consistency with the other figure used.

SOURCE: Central Mortgage and Housing Corporation, *Housing in Canada*, various issues.

EXCESS OF UNPLACED APPLICANTS OVER UNFILLED VACANCIES IN CONSTRUCTION TRADES[a], 1952-54

1952	Bricklayers	Carpenters	Painters	Plasterers	Plumbers and pipe fitters	Other skilled and semi-skilled construction workers	Total skilled and semi-skilled	Unskilled	Total
January	2,905	28,343	6,962	1,319	1,491	2,147	43,167[c]	24,620	67,787[c]
February	3,171	29,360	6,617	1,209	1,757	3,826	45,940	26,949	72,889
March	2,992	28,117	5,773	1,022	1,923	2,589	42,416	27,582	69,998[c]
April	1,824	20,067	2,968	601	1,623	2,141	29,224	17,096	46,320
May	803	11,030	1,092	308	1,129	633	14,995[c]	9,668	24,663
June	432	7,279	880	249	812	821	10,473	7,171	17,644
July	94	5,000	1,073	162	650	544	7,523	5,571	13,094
August	(31)	4,006	854	78	518	346	5,771	3,361	9,132
September	54	2,589	1,033	4	243	297	4,220	1,936	6,156
October	(130)	4,082	1,855	21	220	512	6,560	4,668	11,228
November	466	8,956	3,481	285	392	1,634	15,214	10,231	25,445
December	1,905	21,961	5,852	684	741	4,132	35,275	23,704	58,979
1953									
January	3,043	31,024	7,029	908	1,102	5,230	48,336	33,406	81,742
February	3,054	33,394	6,423	833	1,518	5,272	50,494	35,528	86,022
March	2,541	31,327	4,866	753	1,750	4,952	46,189	34,336	80,525
April	1,580	19,654	2,220	445	1,449	2,848	28,196	20,597	48,793
May	527	9,531	626	239	1,026	1,317	13,266	11,217	24,483
June	317	5,663	545	101	671	775	8,072	9,189	17,261
July	73	3,963	707	30	472	691	5,936	7,767	13,703
August	112	4,149	777	(55)	388	565	5,936	6,780	12,716
September	(49)	4,198	1,254	(63)	358	724	6,422	7,853	14,275
October	140	6,442	2,305	72	545	1,617	11,121	15,161	26,282
November	802	16,250	4,986	325	1,202	3,958	27,523	36,413	63,936
December	2,431	30,080	7,481	786	1,936	8,463	51,177	61,918	113,095

Table 16 (cont'd)

EXCESS OF UNPLACED APPLICANTS OVER UNFILLED VACANCIES IN CONSTRUCTION TRADES[a], 1952-54

1954[b]	Bricklayers	Carpenters	Painters	Plasterers	Plumbers and pipe fitters	Other skilled and semi-skilled construction workers	Total skilled and semi-skilled	Unskilled	Total
January	4,400	42,656	9,009	1,312	2,960	11,398	71,735	81,901	153,636
February	4,583	44,381	8,575	1,250	3,495	11,651	73,935	83,919	157,854
March	3,867	41,602	6,822	1,272	3,689	11,434	68,686	81,762	150,448
April	2,576	31,357	4,518	949	3,328	9,188	51,916	59,679	111,595
May	1,255	15,557	1,560	378	2,329	5,592	26,671	30,974	57,645
June	747	11,090	1,222	206	1,900	4,783	19,948	25,454	45,402
July	427	8,163	1,240	84	1,445	3,607	14,966	19,818	34,784
August	387	6,975	1,414	44	1,259	3,125	13,204	17,765	30,969
September	328	7,083	1,873	94	1,184	3,250	13,812	16,959	30,771
October	447	8,714	3,000	255	1,349	4,391	18,156	20,897	39,053
November	1,047	15,796	5,475	508	1,401	5,986	30,213	38,308	68,521
December	3,312	29,550	7,865	958	2,171	9,825	53,681	63,490	117,171

a These figures represent net workers available in the construction trades. Figures in bracket represent an excess of openings over applicants.
b Monthly data not available after 1954.
c See footnote c to Table 15.

SOURCE: Central Mortgage and Housing Corporation, *Housing in Canada*, various issues.

Table 17

SEASONALITY RATIOS IN THE CONSTRUCTION INDUSTRY, BY OCCUPATIONS, FOR CANADA AND REGIONS, 1952-55[a]

Occupation	Atlantic	Quebec	Ontario
Bricklayers and tile setters	9.40	13.45	10.09
Carpenters	8.01	7.69	5.84
Cement and concrete finishers	6.05	10.40	9.52
Painters, construction and maintenance	6.34	9.26	6.72
Plasterers	8.82	10.80	9.70
Plumbers and steam fitters	3.52	4.45	4.16
Other construction occupations	5.41	5.96	5.64
Total skilled construction occupations	7.18	7.19	5.96
Unskilled construction occupations	5.69	6.25	5.59

	Prairies	Pacific	Canada, average
Bricklayers and tile setters	16.10	3.22	10.26
Carpenters	14.50	4.04	6.97
Cement and concrete finishers	15.23	4.26	8.26
Painters, construction and maintenance	8.23	4.03	6.81
Plasterers	29.00	6.25	10.09
Plumbers and steam fitters	4.41	2.81	3.77
Other construction occupations	12.79	4.49	6.26
Total skilled construction occupations	12.09	3.63	6.60
Unskilled construction occupations	10.50	4.20	6.13

a See text for method of computation.

SOURCE: Courtesy Economics and Research Branch, Department of Labour, Ottawa.

Table 18

MALE LABOUR FORCE IN CONSTRUCTION OCCUPATIONS[a] AS PERCENTAGE OF ALL OCCUPATIONS, BY AGE GROUPS, CANADA AND THE PROVINCES, 1951

Province	All ages	Under 20	20–24	25–34	35–44	45–64	Aged 65 or more
Canada	7.8	4.0	6.5	7.7	8.6	8.7	8.4
Newfoundland	8.1	1.6	3.8	7.7	10.3	10.9	9.6
Prince Edward Island	6.1	2.6	4.5	5.6	7.7	7.3	5.2
Nova Scotia	8.2	2.8	4.4	7.6	9.9	10.5	8.7
New Brunswick	6.8	1.8	4.0	6.6	8.3	8.4	7.5
Quebec	8.5	4.5	7.9	8.5	9.0	9.8	8.9
Ontario	8.1	4.8	7.2	8.0	8.6	8.6	9.3
Manitoba	6.9	3.4	5.5	7.0	7.7	7.5	7.8
Saskatchewan	3.5	1.5	2.8	3.2	3.8	4.1	4.5
Alberta	7.0	3.6	5.7	7.4	8.2	7.3	6.7
British Columbia	8.7	3.6	5.5	7.8	10.4	10.0	9.2

a Includes owners, managers and officials, foremen, inspectors, brick and stone masons, carpenters, cement and concrete finishers, construction machinery operators, electricians and wiremen, painters, decorators and glaziers, plasterers and lathers, plumbers and pipe fitters, structural iron workers, and others.

SOURCE: Computed from data in *Census of Canada, 1951*, Vol. IV, Table 11.

Table 19

DIFFERENCE IN PERCENTAGE DISTRIBUTION, FOR AGE GROUPS, OF MALES IN CONSTRUCTION OCCUPATIONS FROM DISTRIBUTION OF AGES OF THE MALE LABOUR FORCE[a] CANADA[b]—1951

Occupation	Under 35	35-64	65 and over
Construction	− 6.1	− 5.7	− 0.4
Owners, managers and officials[c]	−20.0	+18.3	+ 1.7
Foremen	−22.7	+20.6	+ 2.1
Inspectors	−18.6	+12.7	+ 5.9
Brick and stone masons	+ 4.8	− 6.5	+ 1.7
Carpenters	−11.7	+ 9.7	+ 2.0
Cement and concrete finishers	− 7.9	+ 8.4	− 0.5
Construction machinery operators	+ 5.9	− 2.3	− 3.6
Electricians and wiremen	+ 9.3	− 5.7	− 3.6
Painters, decorators and glaziers	− 6.8	+ 6.6	+ 0.2
Plasterers and lathers	+ 8.8	− 8.3	− 0.5
Plumbers and pipe fitters	+ 3.2	− 0.9	− 2.3
Structural iron workers	+ 2.4	+ 0.6	− 3.0
Other	+ 4.7	− 2.6	− 2.1

a A plus sign denotes a larger proportion in the construction occupation than in the male labour force; a minus sign denotes a smaller proportion.

b Excluding Yukon and Northwest Territories.

c Owners, managers and officials in construction are not ordinarily included among census listings of construction occupations, but have been included here because of their importance to the industry concept.

SOURCE: Based on data in *Census of Canada, 1951*, Vol. IV, Table 11.

Table 20

PERCENTAGE DISTRIBUTION OF MALE LABOUR FORCE IN CONSTRUCTION AND ALL OCCUPATIONS BY PLACE OF BIRTH, CANADA[a] 1951

Occupation	Total[b]	Place of Birth				
		Canada	United Kingdom	Europe[c]	United States	Asia
All occupations	100	79.6	8.2	9.1	2.6	0.5
Construction	100	78.2	8.9	10.3	2.5	0.1
Owners, managers and officials[d]	100	74.7	11.0	10.7	3.5	0.1
Foremen	100	79.5	8.6	8.5	3.4	—
Inspectors	100	75.6	18.5	3.3	2.6	—
Brick and stone masons	100	67.8	11.8	19.0	1.4	—
Carpenters	100	78.7	6.3	12.0	2.8	0.2
Cement and concrete finishers	100	57.6	7.4	33.1	1.9	—
Construction machinery operators[e]	100	86.6	4.6	5.0	3.8	—
Electricians and wiremen	100	83.2	10.4	4.3	2.1	—
Painters, decorators and glaziers	100	75.9	12.8	9.2	2.0	0.1
Plasterers and lathers	100	73.6	10.5	14.0	1.9	—
Plumbers and pipe fitters	100	83.3	10.2	4.7	1.8	—
Structural iron workers	100	79.4	7.2	11.2	2.1	0.1
Other	100	77.6	7.1	13.0	2.3	—

a Excludes Yukon and Northwest Territories.

b Excluding unknowns.

c Continental Europe, Republic of Ireland, and Iceland.

d Owners, managers and officials are not included among census listings of construction occupations, but have been included here because of their importance to the industry concept.

e Not elsewhere specified.

SOURCE: *Census of Canada, 1951*, Vol. IV, Table 12.

Table 21

PERCENTAGE DISTRIBUTION OF IMMIGRANT MALE LABOUR FORCE IN CONSTRUCTION OCCUPATIONS, BY PERIOD OF IMMIGRATION, CANADA[a], 1951

Occupation	All periods	1946 to 1951[b]	1941 to 1945	1931 to 1940	1921 to 1930	Before 1921
Construction	100.0	100.0	100.0	100.0	100.0	100.0
Carpenters	39.2	38.5	50.0	34.5	42.1	38.5
Painters, decorators and glaziers	15.9	14.8	25.0	17.2	15.8	16.5
Electricians and wiremen	8.5	9.6	25.0	10.3	7.2	8.4
Owners, managers and officials[c]	8.1	3.7	—	10.3	8.6	9.7
Brick and stone masons	7.2	15.6	—	6.9	5.4	4.9
Plumbers and pipe fitters	7.1	5.9	—	6.9	6.3	8.1
Plasterers and lathers	3.6	5.2	—	3.4	3.2	2.9
Foremen	3.4	0.7	—	3.4	3.6	4.5
Other	2.4	2.2	—	3.4	2.7	1.9
Cement and concrete finishers	1.8	2.2	—	—	2.3	1.3
Construction machinery operators[d]	1.6	0.7	—	3.4	1.8	1.9
Structural iron workers	0.6	0.7	—	—	0.5	0.3
Inspectors	0.6	—	—	—	0.5	1.0

a Excludes Yukon and Northwest Territories.

b Five months only in 1951.

c Owners, managers and officials in construction are not ordinarily included among census listings of construction occupations, but have been included here because of their importance to the industry concept.

d Not elsewhere specified.

SOURCE: Computed from *Census of Canada, 1951*, Vol. IV, Table 12.

IMMIGRATION OF CONSTRUCTION WORKERS, BY TRADE, 1939-55

Trade	1955	1954	1953	1952	1951	1950	1949[a]	1948	1947
Bricklayers and masons	1,364	1,764	1,151	1,191	1,949	303	413	454	164
Carpenters	1,667	2,853	2,376	2,217	3,087	639	809	1,281	778
Painters	610	1,074	891	751	956	174	225	348	241
Plasterers	114	190	171	136	170	37	76	122	55
Plumbers	342	650	545	404	662	98	141	234	164
Electricians	776	1,674	1,468	1,145	2,450	369	581	827	653
Sheet metal workers	142	261	282	201	300	40	72	161	141
Total skilled construction workers	5,015	8,466	6,884	6,045	9,574	1,660	2,317	3,427	2,196
Other construction workers	199	411	819	986	973	448	969	3,075	671
Total construction workers	5,214	8,477	7,703	7,031	10,547	2,108	3,286	6,502	2,867

	1946	1945	1944[b]	1943[b]	1942[b]	1941[b]	1940[b]	1939[b]
Bricklayers and masons	21	8	10	5	6	5	6	8
Carpenters	267	264	166	106	74	59	58	35
Painters	80	30	22	13	9	12	16	20
Plasterers	8	2	1	0	1	4	3	6
Plumbers	64	31	34	25	14	11	11	13
Electricians	169	65	27	18	22	16	21	20
Sheet metal workers	24	45	5	6	1	4	6	17
Total skilled construction workers	633	445	265	173	127	111	121	119
Other construction workers	51	0	0	6	11	10	15	6
Total construction workers	684	445	265	306	138	121	136	125

a Newfoundland not included before 1949.

b Estimated from fiscal year figures.

SOURCE: Central Mortgage and Housing Corporation, *Housing in Canada*, 4th Quarter, 1954, p. 91 and 1st Quarter, 1953, p. 105; *Canadian Housing Statistics*, 4th Quarter, 1955, p. 28.

Table 23

MALES IN CONSTRUCTION OCCUPATIONS: PERCENTAGE CONTRIBUTION BY PLACE OF BIRTH[a], 1951

Province	Total in construction occupations	Place of birth				
		Canada	United Kingdom	Europe[b]	United States	Asia
Canada—Total	298,713	234,109	26,087	30,505	7,182	276
Percent	100	78.4	8.7	10.2	2.4	0.1
Newfoundland—Total	7,103	6,998	20	35	50	—
Percent	100	98.5	0.3	0.5	0.7	—
Prince Edward Island—Total	1,656	1,593	18	9	35	—
Percent	100	96.2	1.1	0.5	2.1	—
Nova Scotia—Total	14,011	13,344	286	150	215	3
Percent	100	95.2	2.0	1.1	1.5	—
New Brunswick—Total	8,779	8,337	207	81	145	1
Percent	100	95.0	2.4	0.9	1.7	—
Quebec—Total	91,025	84,825	1,684	3,269	1,144	32
Percent	100	93.2	1.9	3.6	1.3	—
Ontario—Total	105,999	75,653	14,150	14,185	1,650	106
Percent	100	71.4	13.3	13.4	1.6	0.1
Manitoba—Total	14,999	8,879	1,527	3,232	323	16
Percent	100	65.9	10.2	21.5	2.2	0.1
Saskatchewan—Total	8,123	5,119	815	1,549	630	3
Percent	100	63.0	10.0	19.1	7.8	—
Alberta—Total	18,760	11,377	2,050	3,723	1,553	24
Percent	100	60.6	10.9	19.8	8.3	0.1
British Columbia—Total	28,258	16,984	5,330	4,272	1,437	91
Percent	100	60.1	18.9	15.1	5.1	0.3

a Excluding owners, managers and officials.

b Continental Europe, Republic of Ireland and Iceland.

SOURCE: *Census of Canada, 1951*, Vol. IV, Tables 12 and 13.

APPRENTICESHIP TRAINING IN CONSTRUCTION TRADES BY NUMBER IN TRAINING AND GRADUATES IN CANADA, 1946-54

Year	Bricklaying		Carpentry		Painting and decorating		Plastering		Plumbing and steamfitting		Electrical		Sheet metal		All trades	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
1954	385	68	998	207	187	36	226	59	1,970	371	1,970	334	753	114	6,489	1,189
1953	339	64	974	184	159	29	204	72	1,227	325	1,740	300	540	99	5,183	1,073
1952	321	69	946	215	156	35	264	66	1,647	276	1,494	289	589	113	5,417	1,063
1951	347	93	967	233	171	28	270	59	1,578	324	1,358	349	594	112	5,285	1,198
1950	369	124	1,043	260	165	45	252	70	1,607	523	1,273	357	512	136	5,221	1,515
1949[c]	573	300	1,365	557	230	108	245	98	1,704	573	1,336	495	571	192	6,024	2,323
1948	675	211	1,537	437	297	87	248	54	1,555	161	1,342	346	629	163	6,283	1,459
1947	357	28	1,151	172	291	42	161	14	1,182	116	1,170	200	559	70	4,871	642
1946	80	11	289	50	79	18	31	2	499	51	584	65	248	39	1,810	236
Graduates 1946-54		968		2,315		428		494		2,720		2,735		1,038		10,698

a Number in training.

b Graduates.

c Newfoundland not included before 1949.

SOURCE: Central Mortgage and Housing Corporation, *Housing in Canada*, various issues.

Table 25

CONSTRUCTION APPRENTICES GRADUATING IN EACH TRADE AS A PERCENTAGE OF ALL WORKERS IN THAT TRADE, 1946-54

Year	Bricklaying	Carpentry	Painting and decorating	Plastering	Plumbing and steamfitting	Electricians	Sheet metal workers[a]	All trades
1954	0.4	0.2	0.1	0.6	1.3	1.0	3.5	0.4
1953	0.4	0.1	0.1	0.8	1.1	0.9	3.0	0.4
1952	0.4	0.2	0.1	0.7	0.9	0.8	3.5	0.4
1951	0.6	0.2	0.1	0.6	1.1	0.1	3.5	0.4
1950	0.8	0.2	0.1	0.8	1.8	1.0	4.2	0.5
1949[b]	1.9	0.4	0.2	1.1	1.9	1.4	6.0	0.8
1948	1.3	0.3	0.2	0.6	0.5	1.0	5.0	0.5
1947	0.2	0.1	0.1	0.2	0.4	0.6	2.2	0.2
1946	0.1	—	—	—	0.2	0.2	1.2	0.1

a Percentages in this column based on number of sheet metal workers and tinsmiths in the construction *industry* which is less than the number in this trade in all industries. The all-industry figure for this trade is not readily available.

b Newfoundland not included before 1949.

SOURCE: Percentages computed from the number of graduates from Central Mortgage and Housing Corporation, *Housing in Canada*, various issues, and the total number of workers from *Census of Canada, 1951*, Vol. IV, Tables 4 and 23.

Table 26

OCCUPATIONS OF WORKERS IN THE CONSTRUCTION INDUSTRY IN CANADA IN 1951

Occupation	Number of workers
All construction[a]	350,896
Owners, managers, officials	22,757
Accountants	1,075
Agricultural professionals[b]	27
Architects	66
Artists, commercial	19
Authors, editors, journalists	23
Chemists and metallurgists	18
Draughtsmen and designers	613
Engineers, chemical	36
Engineers, civil	2,031
Engineers, electrical	307
Engineers, mechanical	271
Engineers, mining	13
Laboratory technicians[b]	48
Surveyors	756
Other professional occupations	407
Bookkeepers and cashiers	2,534
Office appliance operators	55
Office clerks	5,781
Shipping and receiving clerks	349
Stenographers and typists	2,355
Gardeners	202
Lumbermen	239
Foremen — quarries	11
Labourers — quarries	28
Quarries and rock drillers	1,767
Other occupations — in quarries	27
Foremen — in manufacturing and repair	221
Bakers	11
Butchers and meat cutters	11
Other occupations — in non-metallic mineral products	161
Boiler firemen	331
Hoistmen, cranemen, derrickmen	2,559
Motormen (vehicle), except railway	36
Oilers, machinery	517
Power station operators	46
Riggers[b]	41
Stationary engineers	841
Foremen — construction	10,456
Inspectors — construction	640
Brick and stone masons	13,723
Carpenters	86,260
Cement and concrete finishers	2,566

Table 26 (cont'd)

OCCUPATIONS OF WORKERS IN THE CONSTRUCTION INDUSTRY IN CANADA IN 1951

Occupation	Number of workers
Construction machinery operators[b]	6,518
Electricians and wiremen	13,545
Painters, decorators, and glaziers	27,000
Plasterers and lathers	9,010
Plumbers and pipe fitters	18,860
Structural iron workers	1,147
Other occupations — in construction	5,694
Foremen — transportation	41
Captains, mates, pilots	177
Chauffeurs and taxi drivers	39
Engineering officers — on ships	79
Firemen — on ships	49
Lockkeepers, canalmen, boatmen	63
Longshoremen and stevedores	43
Messengers	35
Seamen, sailors, deckhands	219
Inspectors, graders, scalers — wood	46
Cabinet and furniture makers	196
Finishers and polishers — wood	85
Sawyers — wood	55
Wood turners, planers, etc.	92
Other occupations — in wood products	17
Inspectors, gaugers[b] — metal	29
Assemblers — electrical equipment	106
Blacksmiths, hammermen, forgemen	240
Boilermakers and platers	100
Filers, grinders, sharpeners	75
Fitters, assemblers[b] — metal	28
Machine operators[b]	184
Machinists — metal	441
Mechanics — motor vehicle	1,274
Mechanics[b]	3,755
Millwrights	255
Patternmakers	10
Polishers and buffers — metal	11
Radio repairmen	59
Riveters and rivet heaters	83
Sheet metal workers and tinsmiths	3,246
Toolmakers, die makers and setters	29
Welders and flame cutters	1,596
Other metal-working occupations	71
Stone cutters and dressers	160
Sectionmen and trackmen	114
Switchmen, signalmen, flagmen	31
Teamsters and draymen	105
Truck drivers	15,798

Table 26 (concluded)

OCCUPATIONS OF WORKERS IN THE CONSTRUCTION INDUSTRY IN CANADA IN 1951

Occupation	Number of workers
Other occupations — transportation	24
Linemen and servicemen	615
Telephone operators	101
Agents and appraisers[b]	100
Canvassers and solicitors	90
Sales representatives	431
Purchasing agents and buyers	277
Sales clerks	248
Service station attendants	11
Other occupations — in trade	200
Real estate agents	13
Charworkers and cleaners	108
Cooks	821
Elevator tenders	59
Cafe and household workers[b]	377
Housekeepers, matrons, stewards	26
Janitors	311
Nurses, practical	49
Waiters and waitresses	117
Firemen — fire department	11
Guards, watchmen[b]	1,538
Policemen and detectives	93
Labourers[c]	73,163

a The sum of the numbers shown for the various occupations in this table is less than the total of all workers in the construction industry because of the exclusion of some occupations, mainly those having less than ten workers, accounting for 1,068 workers.

b Not elsewhere specified.

c There is a difference of one between the figure for labourers shown here and that shown in Table I, although both figures are taken from the 1951 Census.

SOURCE: *Census of Canada, 1951*, Vol. IV, Table 23.

Table 27

DISTRIBUTION OF CONSTRUCTION OCCUPATIONS IN RESIDENTIAL CONSTRUCTION, 1953

Occupation	Man-hour requirements[a]	Expenditures on construction labour[b]
	Percentage distribution	
Carpenters	22.2	27.1
Labourers	29.2	19.8
Bricklayers	9.4	13.9
Painters	9.4	9.3
Carpenter helpers and skilled labour	10.0	7.6
Plasterers	6.1	6.9
Plumbers and fitters	4.3	5.1
Lathers	2.9	3.4
Electricians	2.1	2.7
Tile-layers	1.7	1.8
Roofers	1.2	1.0
Cement finishers	0.8	0.9
Caulkers	0.7	0.5
	100.0	100.0

a Estimates for a housing programme of 100,000 dwelling units, prepared by Central Mortgage and Housing Corporation for this study.

b Derived from estimates made by Central Mortgage and Housing Corporation of labour cost components for many different types of houses. The above percentages are weighted averages for all types of dwellings, based upon completions under the National Housing Act during the first six months of 1953.

SOURCE: Courtesy of Central Mortgage and Housing Corporation.

Table 28

CHANGES IN AVERAGE EARNINGS OF HOURLY-RATED WAGE-EARNERS REPORTED IN 1954, AS COMPARED WITH 1953, 1952, 1951 AND 1949

Industry	Percentage change in average hourly earnings in 1954 compared with				Percentage change in average weekly wages in 1954 compared with			
	1949	1951	1952	1953	1949	1951	1952	1953
Canada	(minus sign indicates percentage decrease)							
Mining	34.2	17.9	6.9	2.3	34.2	16.5	6.7	2.0
Metal mining	39.3	19.7	8.9	3.1	35.6	19.7	8.2	2.4
Coal mining	15.7	8.6	–0.1	–1.3	18.5	5.3	0.1	–0.3
Non-metal mining	—	26.1	9.4	2.7	—	17.3	8.9	2.4
Manufacturing	42.8	20.5	9.0	3.7	37.0	17.1	6.6	1.9
Durable goods	42.3	20.5	8.4	3.1	37.0	17.3	6.6	1.3
Non-durable goods	42.8	20.7	10.2	5.3	37.1	16.7	7.5	3.7
Electric and motor transportation	—	20.1	9.3	3.8	—	20.1	8.5	4.0
Construction	46.5	26.1	12.9	3.2	48.7	26.1	9.3	0.0
Buildings and structures	48.8	26.4	12.5	2.4	47.7	27.3	9.4	0.2
Highways, bridges and streets	40.8	26.7	14.8	6.8	49.1	24.3	12.6	6.1
Service	30.5	19.8	12.8	6.1	26.5	15.3	8.3	3.4
Hotels and restaurants	32.1	20.2	13.6	6.3	27.5	14.7	7.9	3.3
Laundries and dry cleaning plants	26.3	17.8	10.6	5.6	25.7	17.3	10.1	4.1

SOURCE: D.B.S., *Review of Man-Hours and Hourly Earnings, 1945-1954.*

Table 29

AVERAGE HOURS AND EARNINGS OF HOURLY-RATED WAGE-EARNERS IN THE CONSTRUCTION INDUSTRY IN CANADA, 1945-55

Year	Construction			Buildings and Structures			Highways, Bridges and Street Construction		
	Average hours	Average hourly earnings	Average weekly wages	Average hours	Average hourly earnings	Average weekly wages	Average hours	Average hourly earnings	Average weekly wages
	No.	¢	$	No.	¢	$	No.	¢	$
1955	39.9	150.9	60.29	39.5	162.5	64.21	40.9	126.1	51.57
1954	40.3	148.3	59.76	39.8	160.6	63.92	41.1	120.5	49.53
1953	41.6	143.7	59.78	40.7	156.8	63.82	41.4	112.8	46.70
1952	41.6	131.4	54.66	40.9	142.8	58.41	41.9	105.0	44.00
1951	40.3	117.6	47.39	39.5	127.1	50.20	41.9	91.5	39.85
1950	39.9	105.6	42.13	39.6	113.3	44.87	40.8	88.1	35.94
1949[a]	39.7	101.2	40.18	40.1	107.9	43.27	38.8	85.6	33.21
1948	39.2	94.1	36.89	39.9	100.9	40.26	37.5	79.3	29.74
1947	39.3	84.6	33.25	39.2	91.0	35.67	39.3	70.7	27.79
1946	38.4	76.9	29.53	38.7	83.4	32.28	37.7	65.7	24.77
1945	38.9	73.5	28.59	40.4	80.9	32.68	36.7	63.2	23.19

a Newfoundland not included before 1949.

SOURCE: D.B.S., *Man-Hours and Hourly Earnings*, various issues, and Central Mortgage and Housing Corporation, *Canadian Housing Statistics*, Quarter 1, 1956.

WAGE RATES[a] IN ELEVEN PRINCIPAL CANADIAN CITIES AT JULY 1, 1954, 1955 AND 1956

City	Plasterers			Plumbers			Sheetmetal workers			Labourers		
	1954	1955	1956	1954	1955	1956	1954	1955	1956	1954	1955	1956
Halifax	1.70	1.83	1.83	1.65	1.78	1.78	1.47	1.55	1.55	1.10	1.18	1.18
Saint John	1.80	1.85	1.85	1.55	1.60	1.70	1.25	1.50	1.50	.75	.75	.80
Quebec	1.70	1.80	1.80	1.45	1.60	1.70	1.50	1.60	1.60	1.15	1.20	1.20
Montreal	2.00	2.05	2.12	2.00	2.10	2.12	1.80	1.80	1.90	1.25	1.25	1.30
Toronto	2.40	2.40	2.45	2.35	2.35	2.44	2.25	2.35	2.40	1.25	1.30	1.45
Hamilton	2.25	2.30	2.40	2.15	2.30	2.35	2.15	2.30	2.35	1.10–1.15	1.15	1.25
Windsor	2.20	2.10	2.20	2.35	2.35	2.35	2.20	2.25	2.25	1.62–1.67	1.66	1.66
Winnipeg	2.10	2.25	2.25	2.00	2.15	2.25	1.75	1.90	1.95	1.05–1.25	1.10	1.20
Saskatoon	1.80–2.00	1.80–2.20	2.20	2.00	2.10	2.15	1.80	1.80	1.85	1.28	1.33	1.38
Edmonton	2.22½	2.22½	2.30	2.25	2.25	2.35	2.05	2.15	2.25	1.30	1.35	1.35
Vancouver	2.30	2.35	2.35	2.35	2.35	2.35	2.25	2.30	2.35	1.60	1.60	1.66
Average	2.22	2.29	2.16	2.01	2.08	2.14	1.86	2.00	1.99	1.24	1.27	1.31

City	Bricklayers			Carpenters			Electricians			Painters		
	1954	1955	1956	1954	1955	1956	1954	1955	1956	1954	1955	1956
Halifax	1.81	1.94	1.94	1.56	1.69	1.69	1.66	1.79	1.79	1.37	1.45	1.45
Saint John	1.80	1.85	1.85	1.53	1.55	1.58	1.57	1.57	1.63	1.34	1.40	1.47
Quebec	1.70	1.80	1.80	1.50	1.60	1.60	1.45	1.60	1.70	1.45	1.50	1.50
Montreal	2.00	2.00	2.10	1.80	1.80	1.90	1.90	2.00	2.00	1.70	1.70	1.80
Toronto	2.35	2.46	2.66	2.20	2.30	2.45	2.33	2.50	2.65	1.95	1.95	2.05
Hamilton	2.30	2.35	2.40	2.10	2.15	2.20	2.25	2.25	2.40	1.65	1.65	1.75
Windsor	2.40	2.45	2.45	2.17	2.22	2.22	2.35	2.35	2.35	1.80	1.80–1.90	1.90
Winnipeg	2.10	2.25	2.25	1.90	2.05	2.05	1.90	2.05	2.20	1.65	1.65	1.70–1.80
Saskatoon	2.18	2.23	2.29	1.85	1.90	1.95	2.00	2.00	2.05	1.65	1.70	1.75
Edmonton	2.30	2.30	2.40	1.95	2.00	2.00	2.25	2.25	2.35	1.65	1.65	1.80
Vancouver	2.40	2.40	2.40	2.22	2.22	2.25	2.30	2.42	2.42	2.12	2.16	2.19
Average	2.12	2.18	2.23	1.89	1.95	1.99	2.00	2.07	2.14	1.67	1.70	1.77

a These rates are primarily union rates, and are given in dollars and cents per hour.

SOURCE: Canadian Construction Association.

Table 31

AVERAGE WAGE RATES FOR EIGHT CONSTRUCTION OCCUPATIONS[a] IN ELEVEN PRINCIPAL CANADIAN CITIES, AT JULY 1, 1954, 1955 AND 1956

City	Average hourly wage rate		
	1954	1955	1956
Vancouver	$2.19	$2.23	$2.25
Toronto	2.14	2.20	2.32
Windsor	2.14	2.15	2.17
Hamilton	2.00	2.06	2.14
Edmonton	2.00	2.02	2.10
Winnipeg	1.82	1.93	1.99
Saskatoon	1.83	1.88	1.95
Montreal	1.81	1.84	1.91
Halifax	1.54	1.65	1.65
Quebec	1.49	1.59	1.61
Saint John	1.45	1.51	1.55
Average, eleven cities	1.86	1.91	1.97

a See Table 30 for the occupations included.

SOURCE: Computed from data in Table 30.

DISTRIBUTION OF MALE WAGE-EARNERS IN ALL CONSTRUCTION OCCUPATIONS BY AMOUNT OF EARNINGS, SELECTED CITIES[a], 1951

City	Total reported wage-earners		Amount of reported earnings						
			Under $500	$500–999	$1,000–1,499	$1,500–1,999	$2,000–2,999	$3,000–3,999	$4,000 and over
	Number	Percent	Percent						
St. John's, Nfld.	1,027	100	8.5	9.9	16.0	20.3	40.8	4.0	0.5
Halifax, N.S.	1,838	100	4.0	5.4	10.8	21.0	52.6	5.7	0.5
Saint John, N.B.	849	100	4.9	7.9	15.2	25.2	42.5	3.7	0.6
Quebec, Que.	6,469	100	7.0	8.6	16.6	25.2	38.2	3.9	0.5
Montreal, Que.	33,291	100	3.7	4.7	11.1	19.2	50.8	9.6	0.9
Ottawa, Ont.	5,146	100	3.9	5.3	11.6	18.4	45.9	13.5	1.4
Toronto, Ont.	24,319	100	4.4	3.5	6.8	11.5	48.7	21.6	3.4
Hamilton, Ont.	5,634	100	4.1	3.5	6.6	11.5	51.1	20.5	2.7
London, Ont.	2,242	100	2.8	3.9	7.1	13.2	54.6	17.6	0.8
Windsor, Ont.	3,002	100	5.2	4.6	6.5	10.5	46.9	23.5	2.8
Winnipeg, Man.	7,809	100	5.0	5.8	10.5	17.8	50.9	9.1	0.9
Calgary, Alta.	4,002	100	3.6	5.1	9.5	16.0	50.3	14.5	0.9
Edmonton, Alta.	5,818	100	4.8	4.6	9.8	17.1	45.9	15.8	2.0
Vancouver, B.C.	10,661	100	3.8	4.4	7.9	13.5	50.7	17.9	1.8
Victoria, B.C.	1,194	100	3.9	4.9	6.4	13.8	53.3	16.9	0.7

a Census metropolitan areas.

SOURCE: Computed from data in *Census of Canada, 1951*, Vol. V, Tables 22 and 23.

Table 33

PERCENTAGE OF PAID WORKERS[a] UNDER AGREEMENT, BY INDUSTRY, 1954

Industry	Percentage
Construction	64.8
Forestry	61.9
Mining	62.5
Manufacturing	55.1
Transportation, storage and communication	84.6
Public utilities	46.8
Trade	9.3
Finance, insurance and real estate	1.1
Service	12.4

a Based on D.B.S. reference paper *The Labour Force, November, 1945-January, 1955*, using the October, 1954 figure, except for Forestry, for which the average of the peak months of January, November and December was used.

SOURCE: Department of Labour, *The Labour Gazette*, Vol. LVI, No. 1, January 1956, p. 84.

Table 34

NUMBER OF UNION MEMBERS AND BRANCHES OF UNIONS IN THE CONSTRUCTION INDUSTRY, 1951-55

(as reported by local union branches)

Year	Branches	Membership[a]
1951	377	83,100
1952	360	84,250
1953	412	106,250
1954	405	109,550
1955	413	109,400

a Rounded to the nearest hundred.

SOURCE: Courtesy Economics and Research Branch, Department of Labour, Ottawa.

Table 35

DISTRIBUTION BY PROVINCE OF LOCAL UNIONS AND MEMBERSHIP IN THE CONSTRUCTION INDUSTRY AT JANUARY 1, 1955

(as reported by local branch unions)

Province	Number of branches reporting	Membership reported
Newfoundland	5	1,591
Nova Scotia	19	3,583
Prince Edward Island	1	9
New Brunswick	16	1,345
Quebec	83	28,395
Ontario	154	40,017
Manitoba	13	3,435
Saskatchewan	23	2,020
Alberta	33	9,106
British Columbia	64	19,291
Yukon and Northwest Territories	1	160
More than one province	1	425
Total	413	109,377

SOURCE: Courtesy Economics and Research Branch, Department of Labour, Ottawa.

Table 36

NUMBER OF LOCAL BRANCHES AND MEMBERSHIP OF UNIONS, THE MAJORITY OF WHOSE MEMBERSHIP IS IN THE CONSTRUCTION INDUSTRY, BY TYPE OF UNION, AT JANUARY 1, 1955

(as reported by international, national and regional unions)

Type of union	Branches	Membership
International unions	752	139,803
National and regional unions	76	19,513
Directly chartered unions	6	442
Unaffiliated local unions	2	180
Total	836	159,938[a]

a Total does not agree with membership indicated in Tables 34 and 35 for reason given in text.

SOURCE: Courtesy Economics and Research Branch, Department of Labour, Ottawa.

Table 37

DISTRIBUTION OF INTERNATIONAL, NATIONAL AND REGIONAL UNIONS, THE MAJORITY OF WHOSE MEMBERSHIP IS IN THE CONSTRUCTION INDUSTRY, BY NUMBER OF MEMBERS, AT JANUARY 1, 1955

(as reported by international, national and regional unions only)

Membership Range	International Unions		National and Regional Unions		Total	
	Number of Unions	Membership	Number of Unions	Membership	Number of Unions	Membership
Less than 500	2	505	—	—	2	505
500 but under 1,000[a]	3	1,072	—	—	3	1,072
1,000 but under 2,500	1	1,962	—	—	1	1,962
2,500 but under 5,000	1	4,810	—	—	1	4,810
5,000 but under 10,000	5	37,606	—	—	5	37,606
10,000 but under 15,000	—	—	—	—	—	—
15,000 but under 20,000	1	16,139	1	19,513	2	35,652
20,000 but under 30,000	1	23,000	—	—	1	23,000
30,000 and over	1	54,709	—	—	1	54,709
Total	15	139,803	1	19,513	16	159,316[b]

a One union for which no membership figures are available is included in this group.

b Total does not agree with membership shown in Table 36 because of exclusion of data for directly chartered unions and unaffiliated local unions.

SOURCE: Courtesy Economics and Research Branch, Department of Labour, Ottawa.

Table 38

BRANCHES AND MEMBERSHIP IN INTERNATIONAL AND NATIONAL UNIONS, WHERE THE MAJORITY OF MEMBERS WORK IN THE CONSTRUCTION INDUSTRY, AT JANUARY 1, 1955

Union	Branches	Membership
(A) International Unions		
Asbestos Workers, International Association of Heat and Frost Insulators and (AFL-TLC)	7	572
Bricklayers, Masons and Plasterers' International Union of America (AFL-TLC)	53	6,151
Bridge, Structural and Ornamental Iron Workers, International Association of (AFL-TLC)	16	6,787
Carpenters and Joiners of America, United Brotherhood of (AFL-TLC)	219	54,709
Electrical Workers, International Brotherhood of (AFL-TLC)[a]	168	23,000
Elevator Constructors, International Union of (AFL-TLC)	10	c
Engineers, International Union of Operating (AFL)[b]	36	9,055
Hod Carriers, Building and Common Laborers' Union of America, International (AFL-TLC)	35	9,910
Lathers' International Union, Wood, Wire and Metal (AFL-TLC)	18	500
Marble, Slate and Stone Polishers, Rubbers and Sawyers, Tile and Marble Setters' Helpers, Marble Mosaic and Terrazzo Workers Helpers, International Association of (AFL)	4	305
Metal Workers' International Association, Sheet (AFL-TLC)	31	4,810
Painters, Decorators and Paperhangers of America, Brotherhood of (AFL-TLC)	50	5,703
Plasterers' and Cement Masons' International Association of the United States and Canada, Operative (AFL-TLC)	21	1,962
Plumbing and Pipe Fitting Industry of the United States and Canada, United Association of Journeymen and Apprentices of the (AFL-TLC)	78	16,139
Stone Cutters' Association of North America, Journeymen (AFL-TLC)	6	200
(B) National and Regional Unions		
Bâtiment et des Matériaux de Construction, Fédération Nationale Catholique des Métiers du (National Catholic Federation of Building and of Construction Materials Trades) (CTCC)	76	19,513

a The International Brotherhood of Electrical Workers is included although less than one-half of its total membership is in the Construction Industry.

b The International Union of Operating Engineers re-affiliated with the TLC during 1955.

c Not available.

SOURCE: Courtesy Economics and Research Branch, Department of Labour, Ottawa.

Table 39

STRIKES AND LOCKOUTS IN THE BUILDING INDUSTRY AND IN ALL INDUSTRIES, CANADA, 1939-54

Year	The Building Industry			All Industries		
	Number of strikes[a]	Number of workers[a]	Time lost in working days[b]	Number of strikes[a]	Number of workers[a]	Time lost in working days[b]
1954	29	12,693	202,303	174	62,250	1,475,200
1953	19	4,658	19,508	166	54,391	1,322,929
1952	51	29,687	343,866	222	120,818	2,879,955
1951	31	7,260	63,569	373	128,620	901,739
1950	12	2,258	28,836	161	192,153	1,389,039
1949[c]	13	3,602	41,120	137	51,437	1,063,667
1948	18	3,322	39,546	154	42,820	885,793
1947	32	6,057	44,262	236	104,120	2,397,340
1946	13	892	6,535	228	139,474	4,516,393
1945	5	325	2,848	197	96,068	1,457,420
1944	6	427	1,212	199	72,290	490,139
1943	4	397	1,186	402	218,404	1,041,198
1942	22	2,872	3,420	354	113,916	450,202
1941	13	3,384	9,365	231	87,091	433,914
1940	6	508	1,398	168	60,619	266,318
1939	3	149	295	122	41,038	224,588

a Data relate to strikes and lockouts commencing during the period.

b Data relate to new strikes and lockouts and to those already in existence.

c Newfoundland not included before 1949.

SOURCE: Central Mortgage and Housing Corporation, *Housing in Canada*, various issues, and Department of Labour, *Strikes and Lockouts in Canada during 1954*.

Table 40

PERSONS WORKING IN THE CONSTRUCTION INDUSTRY ON OR ABOUT JUNE 1, BY ALL STATUS GROUPS AND PAID WORKERS, 1946-56

Year	All status	Paid workers
	(*thousands*)	
1956	467	396
1955	421[a]	357[a]
1954	374	304
1953	377	317
1952	356	290
1951	353	279
1950	325[b]	254[b]
1949[c]	349	271
1948	295	226
1947	256	182
1946	242	184

a July 23.

b Excluding Manitoba which was not included in the survey due to flood conditions.

c Newfoundland not included before 1949.

SOURCE: D.B.S., *The Labour Force, November, 1945-January, 1955*, Reference Paper No. 58, and monthly report on *Persons with Jobs by Industry and Sex and by Occupation and Sex.*

Table 41

AVERAGE NUMBER EMPLOYED ON CONSTRUCTION BY CONTRACTORS, UTILITIES, GOVERNMENTS, AND OTHERS, 1951-55

Year	Contractors	Utilities	Governments	Others	Total
1955	366,743	72,245	63,862	47,380	550,230
1954	316,191	77,137	68,724	50,800	512,852
1953	317,326	79,870	56,640	55,661	509,497
1952	295,991	77,842	55,772	48,348	477,953
1951	286,170	82,364	67,932	31,058	467,524
1951–55:					
Average	316,484	77,892	62,586	46,649	503,611
Percentage	62.8	15.5	12.4	9.3	100

SOURCE: D.B.S., *Construction in Canada*, various issues.

6

COSTS AND PRODUCTIVITY

Costs and productivity trends in Canada cannot be considered apart from cost trends in other countries, particularly the United States, for our construction costs and productivity are influenced by developments outside our borders. While these ties are not as direct or as extensive as in other industries they do exist. For example, some building materials and machinery are imported, bringing new ideas with them; demands for improved working conditions and benefits are frequently patterned after those in the United States and are affected by the close union ties between the two countries; and branches of construction firms with head offices in the United States or United Kingdom contribute capital, techniques and know-how to the new large-scale undertakings which are becoming increasingly frequent in Canada.

Table 1[1] gives a series of indexes relating to the wholesale prices of building materials in Canada, while Table 2 gives a similar index for the United States, and, an index of construction costs in that country. It can be seen that prices of building materials in the United States and Canada have followed much the same trend since 1949, a fact not entirely surprising. Table 3, however, shows that over-all comparisons must be used with caution because there is a very wide regional differential in the prices of building materials within Canada itself. Of course, the same holds true to some degree in the United States. The same caution should be used in analyzing trends in wage rates, as Table 4 shows a marked regional variation in both countries, a variation which is particularly pronounced in Canada. It is, however, clear from this and the following table that wage rates in construction moved up faster in Canada than in the United States since 1949, the gain being 50% compared to an American increase of 39%. Part of this catching up was undoubtedly due to the relatively sharper rise in Canadian wages generally, which reflected a slightly greater proportionate increase in output per man-hour in Canada during the war and postwar periods. Of course, a substantial gap remains and the higher wages prevailing in the United States reflect the higher productivity, incomes and standard of living there.

Nevertheless, the differential between construction wages in the United States and in Canada is substantially greater than in the economy as a whole. This has been variously attributed to lower relative productivity

[1] Tables for Chapter 6 may be found grouped at the end of the chapter.

in construction, lack of organization and planning, and a greater seasonality of activity in this country. Whatever is responsible, comparison of wages for workers in construction occupations shows that skilled tradesmen in 1954 appeared to be getting about $1 an hour more in the American cities which are the geographical counterparts to Halifax, Montreal, Toronto, Winnipeg and Vancouver. These differences in wage rates undoubtedly apply to semi-skilled and unskilled construction workers as well, for the composite of hourly earnings of all construction workers and for those in building construction also reflects a substantial wage differential between the two countries. In 1955 construction wages in Canada were more than 40% lower than in the United States, compared to 25% in manufacturing. As shown in Table 6, wages account for nearly one-third of the final cost of construction in Canada, and a wage differential of 40%, other things being equal, would thus cause final prices of construction in Canada to be about 13% lower than in the United States.

As shown in Table 7, which is based on a comparative price study carried out for the Commission, the cost of residential building materials, ex-tax, averages about 2% lower in Canada than in the United States, while non-residential building materials are about 6% higher. Tax considerations do not affect the outcome of this study since practically all construction materials in Canada are exempt from sales tax. Of course, the results of this study must be used with reservation in view of all the technical difficulties involved in making precise international price comparisons, but there is no reason to doubt its broad conclusions. While a glance at Table 8 shows much variation between individual items, in general, Canadian prices of lumber products, cement, and brick are more favourable than American prices, with most of the other items being more expensive in this country. Table 6 shows that material costs account for roughly half the over-all cost of all construction. In any event, the differential in building material prices between Canada and the United States would in itself tend to result in the Canadian price of residential construction being only very slightly lower, and that of non-residential construction being moderately higher, than equivalent prices in the United States.

The other components of general construction costs in Canada amount to less than 20% of the total, and Table 31 in Chapter 1 suggests that this item is largely made up of profits and returns to unincorporated business, the latter of which undoubtedly contains a large element of owner-managerial salaries and wages. We have no data enabling us to make a comparison of rates of profit in the two countries, but presumably the wages and salaries of individual owners and managers in construction are somewhat lower in Canada, as they are in other sectors of the economy and as construction wages are generally.

Thus, construction wages are about 40% less than in the United States, and material costs for all construction are slightly higher. Therefore, given approximately equal profit rates and no substantial differences in physical output per man-hour between Canada and the United States, we would expect over-all construction costs in Canada to be lower than in the United States, by perhaps 10% to 20%. In fact, of course, there is a tremendous variation from one operation to another, as shown in Table 9. This material on the unit costs of different construction operations is not as representative as might be desired, since the unit costs for the United States pertain only to the Washington area while those in Canada represent the country as a whole. It appears that in items where labour costs are important, Canadian unit costs on the whole are cheaper but, in many operations involving machines, American use of more modern equipment raises productivity sufficiently to offset the higher American wage rates.

Cost of Finished Structures

In an attempt to throw more light on the question of the relative productivities of the Canadian and United States construction industries, absolute construction costs have been computed for a number of different structures in nine United States cities and four Canadian cities in Tables 10 and 11. It is most noticeable that costs are considerably higher for equivalent structures in the United States, largely owing to the higher wage rates not offset by higher productivity in the construction trades.

This difference may be seen for example, by comparing Canadian cities with the equivalent cities in the United States. The cost per cubic foot of similar fireproof brick and steel hotels is $1.30 in Montreal and $1.64 in Boston, a difference of some 26%. The cost of the same structure in Winnipeg was $1.37 per cubic foot and in Minneapolis-St. Paul $1.61, a difference of 18%. The cost was 18% higher in Seattle than Vancouver, and 21% higher in Detroit than in Toronto. Similarly, the cost of a factory or warehouse building of brick and concrete was 29% higher in Boston than in Montreal, 30% higher in Detroit than in Toronto, 28% higher in Minneapolis-St. Paul than in Winnipeg, and 27% higher in Seattle than in Vancouver. Similar differences were observed for other structures, costs being about one-sixth to one-fourth higher in American cities than in the corresponding Canadian cities. This suggests that physical productivity is probably about the same in the two countries, as final selling prices tend to reflect the difference in the costs of factors of production.

Within Canada, building costs were generally highest in Vancouver, lowest in Montreal, and somewhat higher in Toronto than in Winnipeg.

This, however, did not hold true for the two brick-faced wooden structures (a five-storey low rent apartment building, and a one-storey store). In these cases costs were highest in Toronto, lowest in Vancouver, and somewhat higher in Winnipeg than in Montreal. The relative differences in costs were considerable. For example, the cost of the five-storey low rent brick and wood apartment was about 11% higher in Toronto than in Vancouver, and about 10% higher in Toronto than in Montreal, while there was little difference between costs in Toronto and Winnipeg. Although costs in the American cities (excluding New York, in which costs were highest for every type of structure) generally followed the same geographical pattern as in Canada, the differences were considerably less.

Again, in the case of a modern fireproof hotel constructed of brick and steel, the cost was highest in Vancouver, $1.40 per cubic foot, 7% lower in Montreal, and about 2% lower in Toronto and Winnipeg. In the United States, the geographical pattern differed somewhat, costs being highest (outside New York) in Detroit, and progressively lower in Seattle, Boston and Minneapolis. Again, however, the variations were smaller.

Generally, it may be said, except for brick-faced wooden structures, prices in Canada were highest in Vancouver and fell progressively in Toronto, Winnipeg, and Montreal. Another generalization that warrants mention is the relatively larger variations in costs among cities in Canada than among United States cities excluding New York. The relative differences seemed to be about twice as great in Canada.

A similar comparison relating to the costs of residential structures across Canada and the United States, is made in Table 12. In this case, as in the previous one, land costs are excluded since they do not reflect construction costs and would therefore distort the comparisons. In Canada, residential costs were highest in Vancouver, second highest in Toronto, then approximately the same in Winnipeg and Halifax, and lowest in Montreal. Costs, except in the case of the brick veneer ranch house, and the five-room California bungalow, were in most cases decidedly higher in the corresponding American cities, generally by a margin of more than 20%. Costs for the standard brick veneer ranch house averaged 4% below Canadian costs, and cost of a five-room California bungalow of frame construction averaged 11% lower in the United States than in Canada.

In summary, it can be said that in those cases where United States costs were higher, which was the rule and not the exception, the difference was greatest in the case of brick and brick-veneer building, and somewhat less in the case of frame structures. However, within Canada, as the table shows, the order of costs from the highest levels in Vancouver, followed by Toronto, Winnipeg and Halifax, to the lowest levels in Montreal, was not constant for all types of homes.

In many types of residential construction it would appear that Canadian costs are relatively higher than they would be if productivity in house building were equal in the two countries. This is probably due to the greater use of prefabrication techniques and the larger scale of operations in many parts of the United States.

However, over the last few years, the Canadian construction industry has been gaining relative to the American industry in terms of cost, as the following comparisons show. In Tables 13 and 14, an index (1926-29 equals 100) of construction costs made up of labour, materials, profits and overhead components combined, is presented for a number of different structures in Canadian and American cities. There are fairly wide disparities between the rates of increase in cost of the various types of structures in any one city and for the same structures in other cities. Generally speaking, construction costs for finished structures in the United States have increased at a faster rate than in Canada since 1940 despite the larger rise in Canadian wage rates. This suggests, other things being equal, that Canadian productivity has been increasing faster than that in the United States.

Within Canada, the costs of structures have in general increased to the greatest extent in Toronto, and almost as much in Vancouver. The rate of increase has been somewhat lower in Winnipeg and lowest in Montreal. In corresponding cities in the United States (i.e., Boston corresponding to Montreal, Detroit to Toronto, Minneapolis-St. Paul to Winnipeg, and Seattle to Vancouver) the behaviour has been similar. While the greatest rise took place in Detroit, there was almost as great an increase in Minneapolis-St. Paul, somewhat less in Seattle, and least in Boston.

Productivity

As noted above, productivity is taken to mean physical output per man-hour. This is not to deny the role that investment in machinery plays in increasing productivity, for the features of the labour-capital relationship are such that changes in productivity of the one are accompanied by changes in productivity of the other. In inter-industry comparisons, the productivity of capital or the productivity of labour can be selected as the yardstick for comparison. Output per man-hour of labour, in value terms, proves the more convenient denominator because of the greater ease in defining it statistically in terms of a unit common to all sectors of industry. In this vein, an interesting paper relating to the Canadian economy appeared in the *Economic Journal* a few years ago,[2] in which estimates were made of the Net National Product per employed

[2] See table on p. 180

person for various industries. The productivities of the various industries follow:

Output per Employee, Selected Industries, 1948

Industry	Output per employee
Mining	$ 5,960
Transport	3,085
Manufacturing	3,044
Trade	2,800
Construction	2,273
Services	2,140
Agriculture and fishing	1,638

SOURCE: A. Maddison, "Productivity in an Expanding Economy," *Economic Journal*, LXII: 247, September, 1952. Output for 1948 was taken by Mr. Maddison from an official breakdown by sectors of net national income. Cf. D.B.S., *National Accounts: Income and Expenditure, 1942-1949*, p. 28.

These figures on output per employee by industries show that labour productivity in the construction industry was the third lowest for the chief industrial sectors of the economy. It was only about 75% of output per employee in manufacturing and 38% of that in mining.

The staff of the Commission has made available to us their estimates of Gross Domestic Product at factor cost per man-hour, which are on a somewhat different basis than that used by Mr. Maddison. Gross Domestic Product is essentially the same concept as Gross National Product at factor cost, except for an adjustment for income paid to, and received from, non-residents. In effect, it measures the net domestic output of each industry, being composed of wages and salaries, other factor earnings, and depreciation allowances. It is *net* of materials and thus eliminates distortions due to variations in material inputs.

Gross Domestic Product per Man-Year, Selected Industries, 1949 and 1955

(1949 dollars)

Industry	1949	1955
Mining	5,695	8,782
Transportation	3,258	3,706
Manufacturing	3,203	3,873
Trade	3,228	3,263
Construction	2,556	3,235
Services	2,283	2,252
Agriculture and fishing	1,919	2,980

The figures in the preceding table confirm Mr. Maddison's results and show construction to be third lowest of the individual sectors in net output per man-year, with annual output amounting to only 45% of that of mining and 80% of that of manufacturing. Of course, like all productivity figures, these results must be used with care, for it is always difficult to measure labour input, particularly in such a seasonal activity as construction. Similarly, measures of net output are never free of conceptual or technical problems. Nevertheless, the results of the above calculations are a valuable indication of levels and trends of output in the various sectors which make up the Canadian economy.

The Commission has also calculated the rates of increase in output per man-hour for various industries. These are shown in the table immediately below:

Gross Domestic Product per Man-Hour and Compound Rates of Growth, Construction and Selected Industries, 1929-55

Output per man-hour

(1949 dollars)

	1929	1945	1949	1955
Mining	1.19	3.27	2.56	3.90
Manufacturing	.97	1.51	1.46	1.81
Trade	1.16	1.37	1.47	1.53
Construction	1.16	1.33	1.24	1.56

Annual compound rate of growth

	1929-55	1945-55	1949-55
Mining	4.67%	1.77%	7.26%
Manufacturing	2.42	1.83	3.65
Trade	1.06	1.11	.67
Construction	1.14	1.60	3.89

It can be seen from the table that in the construction boom from 1949 to 1955, productivity in this industry increased at a phenomenal rate. This, of course, partly reflected the comparatively low levels of activity in earlier years and was not due entirely to improvements in materials or techniques. In the postwar period as a whole, the rate of progress has been less impressive, amounting to under 2%, but it must be remembered that the industry was somewhat disorganized in the immediate postwar years and its labour force had been scattered. In the 26-year period from 1929 to 1955 the rate of gain was even lower, but a large part of this slow progress must be put down to the effects of the depression and war. Compared to both manufacturing and mining, construction has lagged behind in its rate of productivity gain, because it is

less susceptible to mechanization and mass production techniques than those industries, but we believe there is some justification for thinking that its rate of productivity gain is increasing, reflecting the use of new materials and techniques.

There are no data available to enable us to compare rates of productivity gain in Canada with those in other countries. It was, however, pointed out earlier that price and cost data suggest that the Canadian industry may have caught up somewhat with its United States counterpart in the postwar period.

As to absolute levels of productivity, the Anglo-American Council on Productivity estimates that the output per man-hour on similar site operations was approximately 50% higher in the United States than in the United Kingdom. While we have not been able to establish precise international productivity relationships, it is felt that productivity in Canadian building construction cannot on the whole be far different from that in the United States. This conclusion is supported by the data given in the preceding pages which suggest that, with the exception of housing, prices of building construction in the two countries do no more than reflect the difference in costs attributable to differences in wages, materials, and other factors of production. In residential construction the data would suggest that Canadian physical output per man-hour is somewhat below the United States, while for engineering construction no reliable material is available. In the latter sector, however, greater use of modern machinery and equipment may confer some advantage on United States producers for some types of construction.

In making these comparisons it should be noted that so far as can be determined, productivity in the construction industry varies widely from province to province. This is shown in Table 15 in which the net value of construction and the labour force in construction are used as the only data available. It should be emphasized that the provincial distribution of the net value of construction is based on the old D.B.S. construction series and is felt to be less representative than desired. Similarly, provincial labour force data may not be strictly comparable owing to variations in employment patterns in different provinces. It is, however, believed that the figures in this table are broadly accurate in showing a wide variation in productivity between provinces.

Generally speaking, productivity was higher in the western provinces in 1951 and lower in the eastern provinces; output per man-year in Alberta, for example, being double that in Quebec. Since the values for output are net, that is, exclusive of the cost of materials used in production, the differences in productivity do not lie in the higher transportation costs involved in shipping materials to the western provinces. They appear to lie, rather, in the much higher proportion of engineering work done in the

western provinces, a type of construction which is much more highly mechanized than others. In 1953, in the Maritime Provinces and Quebec approximately 35% of the total construction work done was of an engineering nature. In the same year, in the three western provinces, Saskatchewan, Alberta and British Columbia, approximately 50% of the work done was engineering construction.

Having looked at these over-all and provincial productivity figures, and at the same time borne in mind their qualifications and limitations, we conclude that the value of output per man-hour has been increasing in the last few years at what is for the industry an extremely rapid rate. However, productivity and productivity gains have historically been low in the construction industry relative to other commodity-producing industries, and it is unlikely that the industry will ever approach the achievements of the most technologically advanced industries such as mining and manufacturing. Nevertheless, substantial improvements in efficiency should be realized in the years ahead.

In this connection, it should be remembered that several factors peculiar to the construction industry tend to hold back its rate of productivity gain. Construction has not, over the long run, benefited from advances in technology as much as other industries, with the exception of engineering, earth-moving and pipeline construction. In others sectors of the industry, particularly house-building, the conditions under which work is done are less readily controlled. It is more difficult, for example, to apply electrical energy in the industry and certainly infinitely more difficult to use mass production techniques involving highly efficient repetitive processes. Even here, however, new lightweight materials, off-site prefabrication and other techniques are reducing costs and bringing about improvements in productivity. While it is not easy to achieve worthwhile increases in output, there is no reason, in view of the experience of the past few years, to take a pessimistic view of the future.

Table 1

PRICE INDEXES OF RESIDENTIAL BUILDING MATERIALS[a] AND OF ALL NON-RESIDENTIAL BUILDING MATERIALS IN CANADA, 1939-54

(1949 = 100)

Year	Lumber and its products	Cement, gravel and sand	Brick, tile and stone	Paint and glass	Lath, plaster and insulation materials	Roofing materials
1955	127.1	117.6	138.8	122.3	106.1	128.3
1954	124.3	119.2	137.4	116.3	109.1	122.5
1953	127.5	119.5	136.3	113.5	108.8	114.8
1952	129.0	117.7	129.4	108.5	108.8	113.9
1951	131.9	111.0	119.7	110.1	107.0	123.8
1950	108.4	103.4	108.5	97.3	98.8	123.6
1949	100.0	100.0	100.0	100.0	100.0	100.0
1948	94.9	96.3	94.8	101.9	98.8	105.8
1947	75.1	86.4	88.3	94.4	90.9	90.4
1946	62.7	80.3	80.1	80.3	88.2	76.7
1945	59.4	80.4	77.1	79.2	88.7	71.1
1944	58.5	80.2	76.1	81.6	88.6	67.5
1943	53.2	79.7	74.9	83.2	88.6	64.0
1942	47.5	79.3	72.2	81.8	88.6	67.5
1941	43.2	78.0	69.6	75.8	86.9	61.6
1940	36.9	74.5	64.9	64.1	84.3	57.3
1939	32.6	74.0	64.4	54.1	84.0	54.0

PRICE INDEXES OF RESIDENTIAL BUILDING MATERIALS[a] AND OF ALL NON-RESIDENTIAL BUILDING MATERIALS IN CANADA, 1939-54

(1949 = 100)

Year	Plumbing and heating equipment	Electrical equipment and fixtures	Other materials	Composite index of residential building materials	Non-residential building materials	Wholesale prices of all commodities
1955	115.0	132.2	131.9	124.3	123.4	110.4
1954	112.5	119.8	129.7	121.7	121.8	109.4
1953	115.9	121.9	131.4	123.9	124.4	111.3
1952	119.6	122.3	129.5	124.9	123.2	114.0
1951	116.7	123.0	121.7	125.5	118.6	121.1
1950	101.7	106.4	103.7	106.4	105.0	106.5
1949	100.0	100.0	100.0	100.0	100.0	100.0
1948	93.4	97.9	92.9	95.4	95.9	97.5
1947	80.5	85.0	81.9	79.1	84.5	82.3
1946	70.6	67.4	72.4	67.8	75.0	70.0
1945	67.8	64.2	67.5	65.0	71.4	66.6
1944	66.6	63.6	67.4	64.3	70.9	68.0
1943	66.6	63.6	67.4	61.0	70.2	66.3
1942	66.6	63.6	67.2	57.4	69.2	63.4
1941	63.6	62.8	64.4	53.7	66.1	59.7
1940	59.1	61.8	62.4	48.4	62.2	55.0
1939	57.2	59.1	59.8	44.9	60.3	50.0

a The individual items noted in the first nine column heads.

SOURCE: Central Mortgage and Housing Corporation, *Housing in Canada*, 2nd Quarter, 1953 (Tables 65 and 66) and *Canadian Housing Statistics*, 2nd Quarter, 1956 (Tables 43 and 45).

Table 2

INDEX NUMBERS OF WHOLESALE PRICES OF BUILDING MATERIALS AND COST OF CONSTRUCTION, UNITED STATES, 1948-55

(1949 = 100)[a]

Year	Cost of Construction[b]	Building Materials[c]
1955	121.8	123.0
1954	118.8	117.0
1953	118.6	117.0
1952	116.5	116.4
1951	112.4	117.6
1950	104.0	107.0
1949	100.0	100.0
1948	101.4	102.3

a Both indexes mechanically converted to 1949=100.
b U.S. Dept. of Commerce Composite Index, *Survey of Current Business*, various issues.
c United Nations, *Monthly Bulletin of Statistics*, February, 1956.

CONSTRUCTION MATERIAL PRICES, MONTREAL, TORONTO, WINNIPEG, VANCOUVER, OCTOBER, 1955

Material	Montreal	Toronto	Winnipeg	Vancouver
Concrete products				
Cement (per bbl.)	$ 3.54	$ 5.35	$ 4.68	$ 3.85
Sand, per ton	2.50[a]	3.70[a]	3.75[c]	2.90
Gravel, ¾″, per ton	1.40[a]	4.25[a]	3.75[c a]	2.90
Crush stone, ¾″, per ton	1.40[a]	4.25[a]	4.90[c a]	3.00
Ready-mix, ¾″ gravel, 2,000 lb. mix (per cu. yd.)	10.55[a]	14.40[a]	13.00[a]	13.00
Lumber (per MFBM)				
Spruce, 2 x 4/6 x 16	90.00	110.00		
B.C. fir, 2 x 4/6 x 16′	160.00	145.00	117.00	80.00
Spruce T & G sheeting, 1 x 6 random lengths	86.00	115.00		80.00
Oak flooring, 1st grade, ¾″ - 1¾″ wide	235.00	300.00	265.00	270.00
Masonry products				
Bricks, face, red, No. 1 (delivered to site) (per M)	56.00	59.00	68.64	89.00
Concrete block, 8 x 8 x 16 (per C)	20.00	25.00	24.00	24.00
Lime, crushed (per ton)	27.20	29.00	42.40	46.20
Lime, Mason's grey hydrated (per ton)	26.00	33.50	51.20	38.00
Pipe (per foot)				
Vitrified sewer pipe, 4″	0.48	0.36[b]	0.36[b]	0.35
6″	0.72	0.525[b]	0.55[b]	0.50
C.1. soil pipe, double end, 4″	0.94	1.06	1.28	0.99
6″	2.35	2.25	3.05	1.85
Concrete pipe, 8″ (non-reinforced)	0.54	0.52	0.80	0.55
10″	0.70	0.79	0.95	0.71
12″	0.86	0.99	1.15	0.92
15″	1.23	1.48	1.85	1.56
Steel (per cwt.)				
Reinforcing bars, ¾″	7.00	4.83	8.70	8.13
Mild steel bars, ¼′ base	6.25	6.75	10.20[b]	8.74
Bands, 3/16″ and lighter	6.60	7.10	11.10[b]	9.59
Angles (sizes mfg'd. in Canada) 3″	6.55	6.75	10.25[b]	8.74

Table 3 (cont'd)

CONSTRUCTION MATERIAL PRICES, MONTREAL, TORONTO, WINNIPEG, VANCOUVER, OCTOBER, 1955

Material	Montreal	Toronto	Winnipeg	Vancouver
Channels (bar mill sizes)	$ 8.00	$ 8.00	$10.25[b]	$ 9.59
Tees (bar mill sizes)	8.00	8.00	12.00	9.59
Plates 3/8" and up (48" to less than 60")	7.55	7.05	10.00[b]	8.88[e]
Plates 5/16" (48" to less than 60")	7.65	7.15	10.00[b]	8.98[e]
Plates 1/4" (48" to less than 60")	7.80	7.30	9.90[b]	9.13[e]
Plates 3/16" (48" to less than 60")	7.95	7.45	9.90[b]	9.38[e]
Blue annealed sheets, 36" wide, 10 gauge	7.60	7.20	8.50	9.45
Road building materials				
Paving Asphalt (per ton)	27.00[b]	27.00[b]	37.60[b]	30.00
Asphalt Binder, M.C. per 100 gallons	15.40[b]	15.40[d b]	18.10	17.20
Asphalt Binder, R.C. per 100 gallons	16.50[b]	16.50[d b]	19.20	17.70
Dust Layer, Oil	13.20[b]	13.20[d b]	16.20	15.70
Calcium Chloride (car load lots, per ton)	43.80	30.00[f]	73.00	63.60
Asphalt Emulsions (tank car lots, per 100 gallons)	19.36	17.90	22.32	12.42
Water treatment supplies				
Chlorine (10 cylinders or more per lb.)	0.1205	0.1250	0.1615	0.1725
Alum (3 to 19 bags per 100 lbs.)	3.15	3.45	4.50	4.30
Activated Carbon (over 5 ton lots per cwt.)	—	16.00	13.50	15.00
Miscellaneous				
Asphalt Shingles, 210 lbs. (per square)	9.00	8.45	10.55	9.65
Wire Nails, 2½" (per keg)	9.10	9.56	11.40	10.50
Rock Wool Insulation, (2" paper backed batts) per M	45.00	39.00	58.00	61.50
(3" paper backed batts) sq. ft.	60.00	51.00	79.00	83.00
Expanded Metal Lath, 2.5 lb. (per sq. yd.)	0.42	0.46	0.53	0.57
Paint, House, Best Quality (per gallon)	6.35	7.25	6.00	6.25

a Plus heating charge December 1-March 31.
b These prices include federal sales tax or provincial or municipal taxes. Other prices do not include tax.
c Per cubic yard.
d In tank cars F.O.B. Sarnia.
e Vancouver steel prices now quoted on 4,000-9,999 lb. basis.
f F.O.B. Amherstburg.

SOURCE: *Engineering and Contract Record*, October, 1955, p. 134.

COMPARATIVE HOURLY WAGE RATES FOR FIVE MAIN CONSTRUCTION TRADES, IN SELECTED UNITED STATES AND CANADIAN CITIES, 1940, 1950 AND 1954[a]

Trade and Year	Halifax	Boston	Montreal	New York	Toronto	Detroit	Winnipeg	Minneapolis	Vancouver	Seattle
	(Can. $)	(U.S. $)	(Can. $)	(U.S. $)	(Can. $)	(U.S. $)	(Can. $)	(U.S. $)	(Can. $)	(U.S. $)
Bricklayers										
1954	1.86	3.09	2.00	3.80	2.35	3.25	2.10	3.23	2.40	3.30
1950	1.44	2.78	1.60	3.25	1.95	2.75	1.75	2.40	1.88	3.00
1940	1.00	1.50	0.88	2.00	1.05	1.50	1.10	1.38	1.10	1.60
Carpenters										
1954	1.61	2.75	1.80	3.40	2.25	3.05	1.90	2.80	2.22	2.65
1950	1.23	2.38	1.40	3.00	1.75	2.50	1.50	2.12	1.68	2.20
1940	0.70	1.38	0.77	1.85	0.95	1.25	0.85	1.25	0.75–0.90	1.25
Electricians										
1954	1.71	3.00	1.90	3.30	2.43	3.25	1.90	2.90	2.38	3.00
1950	1.33	2.60	1.50	3.00	1.85	2.75	1.50	2.35	1.78	2.40
1940	0.95	1.50	0.83	2.00	1.10	1.65	0.85	1.38	0.85–1.00	1.50
Painters										
1954	1.37	2.50	1.70	2.89	1.95	2.85	1.65	2.65	2.12	2.63
1950	1.07	2.10	1.30	2.45	1.50	2.25	1.20	2.05	1.50	2.20
1940	0.65	1.25	0.70	1.50	0.80	1.25	0.70	1.25	0.625–0.80	1.25
Plumbers										
1954	1.70	3.00	2.00	3.50	2.35	3.13	2.00	4.00	2.35	3.05
1950	1.30	2.45	1.58	3.00	1.85	2.63	1.65	2.32	1.75	2.50
1940	0.95	1.50	0.85	2.00	1.00	1.50	0.95	1.38	1.00	1.50

a American rates for 1940 are for June 1; for 1950 and 1954, July 1. Canadian rates for 1940 are for September 1, or later; for 1950 and 1954, October 1.

SOURCE: Canadian data are from Department of Labour, Economics and Research Branch, *Wage Rates and Hours of Labour in Canada*, Annual Report, various issues. United States data are from United States Department of Labor, Bureau of Labor Statistics, *Handbook of Labor Statistics*, Table C-12, and *Union Wages and Hours: Building Trades*, various issues.

Table 5

AVERAGE HOURLY EARNINGS OF CONSTRUCTION WORKERS DURING THE POSTWAR DECADE IN CANADA AND THE UNITED STATES

Year	All Construction		Building Construction	
	Canada[a]	United States	Canada[a]	United States
	(Can. $)	(U.S. $)	(Can. $)	(U.S. $)
1955	1.51	2.60	1.63	2.66
1954	1.48	2.54	1.61	2.60
1953	1.44	2.43	1.57	2.48
1952	1.31	2.27	1.43	2.31
1951	1.18	2.15	1.27	2.19
1950	1.06	1.98	1.13	2.03
1949	1.01	1.87	1.08	1.94
1948	.94	1.79	1.01	1.85
1947	—	—	0.91	1.68
1946	—	—	0.83	1.48

a As reported by employers with 15 or more employees.

SOURCE: Canadian data from Central Mortgage and Housing Corporation, *Housing in Canada*, various issues; United States data from United States Departments of Labor and Commerce, *Construction Review*, and 1955 Historical and Descriptive Supplement to *Economic Indicators*, 84th Congress, 1st Session, prepared for the Joint Committee on the Economic Report by the Committee Staff and the Office of Statistical Standards, Bureau of the Budget.

Table 6

LABOUR, MATERIAL AND OTHER CONTENT OF CONTRACT CONSTRUCTION PERFORMED IN CANADA, 1951-55

Year	Millions of Dollars			Percentage Distribution		
	Wages and salaries	Cost of materials	Other expenses[a]	Wages and salaries	Cost of materials	Other expenses
1955	1,279.8	1,897.5	829.0	31.9	47.4	20.7
1954	1,077.3	1,599.5	704.8	31.9	47.3	20.8
1953	1,085.7	1,588.1	684.6	32.3	47.3	20.4
1952	969.1	1,617.1	441.0	32.0	53.4	14.6
1951	778.5	1,284.5	427.4	31.3	51.6	17.2
1951–55	5,190.4	7,986.7	3,086.8	31.9	49.1	19.0

a Derived by subtracting "wages and salaries" and "cost of materials" from "value of work performed" by contractors.

SOURCE: D.B.S., *Construction in Canada, 1953-55* and *1954-56*.

Table 7

RELATIVE PRICES OF CANADIAN AND AMERICAN BUILDING MATERIALS, 1954

Materials	Weight	Price relative ex-tax Can./U.S.
	%	%
Residential		
Cement	4.4	89
Cement mix	1.1	104
Sand and gravel	2.1	100
Brick, tile and stone	5.0	89
Lumber and lumber products	39.5	90
Hardwood flooring	3.1	103
Lath, plaster and insulation	11.3	88
Roofing	2.9	122
Paint and glass	3.2	104
Plumbing and heating	18.6	112
Electrical supplies	3.8	114
Other	5.0	110
Composite of above items	100.0	98
Non-residential		
Cement, bricks, stone, gravel	15.5	89
Concrete mix and blocks	8.5	104
Lumber and lumber products	10.5	95
Plumbing and heating	21.4	116
Electrical equipment and fixtures	11.5	115
Reinforcing and structural steel	16.7	104
Steel and metal work	3.4	108
Other	12.5	111
Composite of above items	100.0	106

SOURCE: J. H. Young, *Canadian Commercial Policy*, a study prepared for the Royal Commission on Canada's Economic Prospects. Reference should be made to this study for detailed source material and methods.

Table 8

COMPARISON OF CONSTRUCTION COMPONENT COSTS, CANADA AND THE UNITED STATES, 1955

Materials	U.S. Price	Can. Price	Price relative ex-tax Can./U.S.
	$	$	%
General Construction Materials			
Cement — (per bbl.)	5.01	4.47	89
Ready-mix concrete — 2000 lbs. per cu. yd.	12.54	13.10	104
Brick, face red No. 1 — per M.	71.00	63.00	89
Concrete blocks 8″ x 8″ x 16″ per 100	23.00	24.00	104
Lime — dehydrated — per 100 lbs.	1.86	1.70	91
Asphalt shingles — 210# per sq.	8.17	10.53	129
Rock wool insulation — 3″ per M. sq. ft.	81.00	61.00	75
Lumber — Spruce Sheeting 1″ x 6″	120.00[a]	104.00	87
— Oak flooring ¾″ x 1¾″ select per M. bd. ft.	260.00	268.00	103
Plywood, fir ¼″, 4′ x 8′	4.19[b]	4.80[c]	100
Interior door — 6′6″ x 2′6″ x 13/8″ each	10.43	8.35	80
Wood screws — ¾″ x 5″ per 144	0.60	0.65	108
Finishing nails — 1½″ per 2#	0.35	0.28	80
Roofing nails — 1¾″ per #	0.23	0.19	83
3″ x 3″ brass door hinge	0.70	0.75[d]	99
Key door lock-brass	7.95	9.95	125
Key door lock-brass	5.85	7.25	124
Pipe — gal. — 1″ T's	0.35	0.45	129
Pipe fitting — copper ½″ T's	0.19	0.24	126
Pipe fitting — copper ½″ pipe per ft.	0.335	0.28	84
Vitrified sewer pipe — 6″ per ft.	0.45	0.60	133
Soil pipe — 4″ x 5′	4.65	5.15	111
Galvanized pipe — 1″ per ft.	0.29	0.34	117
Floor tile — Asphalt — ⅛ gauge light	0.09	0.09	100
— Asphalt — red	0.11	0.115	104
— brown & black	0.065	0.075	115
— Vinyl plastic — ⅛ gauge	0.16	0.13	81
— Cork — ⅛ gauge	0.30	0.29	97
— Rubber — 3/32 gauge	0.20	0.23	115
— Cork — ⅛ gauge	0.29	0.29	100
— Rubber — ⅛ gauge	0.30	0.36	120
— Asphalt — ⅛ gauge	0.065	0.08	123
Glass (f.o.b. factory)			
Single — 12 x 24″ per box	4.25	3.97	93
— 20 x 20″	4.25	3.97	93
— 24 x 24″	4.57	4.32	94
Double — 24 x 24″	6.48	6.48	100
— 28 x 28″	6.66	6.48	97
— 30 x 30″	6.66	6.48	97
— 36 x 36″	7.82	7.32	94
Window glass (at retail)			
Single — 8 x 10″ each	0.19	0.14	74
Double — 24 x 36″	3.40	2.57	76
— 24 x 48″	5.44	3.97	73
— 36 x 60″	12.00	10.03	84

Table 8 (cont'd)

COMPARISON OF CONSTRUCTION COMPONENT COSTS, CANADA AND THE UNITED STATES, 1955

	U.S. Price	Can. Price	Price relative ex-tax Can./U.S.
	$	$	%
Thermopane — double glazed, ¼"			
20 x 60" each	32.00	40.28	126
36 x 55½"	53.00	63.68	120
36 x 75"	71.00	77.65	109
72 x 84"	150.00	172.64	115
Paint (per imp. gal. at retail)			
Interior flat wall paints	6.38	7.75	121
Interior semi-gloss and gloss	7.13	8.35	117
Interior latex wall	6.86	8.15	119
Interior floor enamels	7.19	8.25	115
Interior & exterior 1st quality enamels	10.94	10.50	96
Interior & exterior 1st quality varnishes	10.38	10.25	99
Exterior white	7.28	6.74	93
Electrical Wires and Cables (per 100 lbs.)			
Bare copper #4	52.10	54.54	105
#12	53.10	55.72	105
Weatherproof #6	50.93	58.95	116
#4/0, 19	49.18	58.37	119
Building wires:			
Canadex #14	32.98	37.62	114
#8	137.70	168.43	122
Flameseal #14	10.79	11.20	104
#10	23.80	24.49	103
Flexible cords:			
2/18 1/64" pot cord	10.50	12.50	119
1/32"	15.75	17.00	108
Plumbing and Heating Fixtures			
(Manufacturers' Suggested Retail Prices)			
Bathtubs—5'	83.35	81.85	98
	103.80	94.20	91
	81.55	89.10	109
Water Closets	79.80	72.20	90
	154.83	153.75	99
	44.25	43.90	99
	62.00	57.30	92
Basins	89.35	77.90	87
	12.40	10.48	85
	8.65	9.90	114
	61.95	65.53	106
	72.65	73.60	101

Table 8 (cont'd)

COMPARISON OF CONSTRUCTION COMPONENT COSTS, CANADA AND THE UNITED STATES, 1955

	U.S. Price	Can. Price	Price relative ex-tax Can./U.S.
	$	$	%
Furnaces — Warm air — oil 75,000 BTU			
— Forced air (high)	343.80	376.00	109
— Forced air (low)	364.20	435.00	119
— Warm air — oil 100,000 BTU			
— Forced air (high)	440.00	528.00	120
— Forced air (low)	460.00	552.00	120
Furnaces — Hot water, oil, 75,000 BTU	390.04	492.48	126
— Hot water, oil, 100,000 BTU	578.60	724.00	125
	440.00	500.00	114
Hot water heater — 25 gal. automatic	119.50[h]	129.50[e]	101
Bedroom light (ceiling)	3.95	3.95[f]	93
Living room lamp	6.50	7.50[g]	106

a Spruce or pine.
b Plus delivery.
c Delivered.
d Includes tax of 6¢.
e Includes tax of $8.67.
f Includes tax of 30¢.
g Includes tax of 60c.
h U.S. 30 gal.

SOURCE: Same as for Table 7.

Table 9

COMPARATIVE UNIT COSTS FOR SELECTED TYPES OF CONSTRUCTION OPERATIONS, CANADA AND THE UNITED STATES, FEBRUARY, 1956

Operation	Unit	Canada	United States
Unit costs cheaper in Canada			
Excavate trench and throw out (by hand)	Yard cube	$ 4.00	$ 4.75
Steel reinforcement	Ton (2,000 lbs.)	200.00	238.00
Formwork to slabs, beams and columns	Foot superficial	0.60	0.75
Common brickwork	1,000 bricks	110.00	120.00
12 inch cinder blocks	Foot superficial	0.75	0.79
Asbestos shingles to walls	Square	20.00	25.00
Acoustic tiles glued to ceilings	Foot superficial	0.30	0.48
Single strength clear glass (in squares 2-4 feet superficial)	" "	0.30	0.54
Double strength clear glass (ditto)	" "	0.40	0.65
1/8 inch hammered glass (ditto)	" "	0.75	1.43
Obscured wired glass (ditto)	" "	1.00	1.79
1/4 inch polished plate glass (ditto)	" "	1.30	1.49
1/4 inch wired polished plate glass (ditto)	" "	1.90	2.00
Prime and two coats of paint on doors	Yard superficial	1.50	1.60
Unit costs cheaper in United States			
Bulk excavation (by machine)	Yard cube	2.00	0.60
Concrete	" "	18.00	16.70
4 inch cinder blocks	Foot superficial	0.50	0.40
8 inch cinder blocks	" "	0.60	0.56
Asphalt floor tiling (medium grade)	" "	0.40	0.24
Asphalt shingles[a]	Square	20.00	14.20
Structural steel	Ton (2,000 lbs.)	300.00	285.00
Two coats of plaster	Yard superficial	2.25	1.70
Drywall construction (1/2 inch gypsum board, taped)	" "	2.00	1.29
Prime and two coats of paint on walls	" "	1.25	0.70

a Thick butt weighing 210 lbs. per 100 sq. ft.

SOURCE: Data for Canada provided by the Department of Public Works, Ottawa. Data for the United States provided by the Real Estate Department of the American Security and Trust Company, in conjunction with the Federal Housing Administration. American data relate only to the Washington area.

COMPARATIVE COSTS OF CONSTRUCTION OF REPRESENTATIVE BUILDINGS IN FOUR CANADIAN CITIES, FEBRUARY, 1956

Type of Construction	Representative volume in cubic feet	Montreal	Toronto	Winnipeg	Vancouver
		Representative total cost	Representative total cost	Representative total cost	Representative total cost
		Canadian dollars			
Apartment[a]					
5-storey, low rent, brick and wood	365,000	369,015	382,155	381,790	354,780
5-storey, luxury, brick and concrete	365,000	483,260	525,600	509,540	531,440
Hotel					
modern, fireproof, brick and steel construction	3,200,000	4,153,600	4,403,200	4,396,800	4,473,600
Factory building or warehouse					
brick and concrete construction	384,000	176,640	185,856	178,176	188,544
Office building					
average, fireproof, stone-faced, with elevators	1,500,000	2,329,500	2,488,800	2,455,500	2,499,000
Store					
average, one-storey, face brick, veneer construction	43,200	15,466	16,927	15,941	14,515

a Assumed to contain units of 1, 3 and 4 rooms with bath.
SOURCE: Same as for Table 11.

Table 11

COMPARATIVE COSTS OF CONSTRUCTION OF REPRESENTATIVE BUILDINGS IN SELECTED UNITED STATES CITIES, FEBRUARY, 1956

Type of Construction	Representative volume in cubic feet	St. Louis	San Francisco	Seattle	Washington
		Representative total cost	Representative total cost	Representative total cost	Representative total cost
		United States dollars			
Apartment[a]					
5–storey, low rent, brick and wood	365,000	446,395	428,145	423,765	407,340
5–storey, luxury, brick and concrete	365,000	659,555	649,335	653,715	619,040
Hotel					
modern, fireproof, brick and steel	3,200,000	5,315,200	5,302,400	5,276,800	5,107,200
Factory building or warehouse					
brick and concrete construction	384,000	239,616	233,472	238,848	220,032
Office building					
fireproof, stone-faced, with elevators	1,500,000	3,061,500	3,013,500	3,034,500	2,872,500
Store					
average, one-storey, face brick, veneer construction	43,200	18,662	17,842	17,366	17,798

COMPARATIVE COSTS OF CONSTRUCTION OF REPRESENTATIVE BUILDINGS IN SELECTED UNITED STATES CITIES, FEBRUARY, 1956

Type of Construction	Representative volume in cubic feet	Boston	Chicago	Detroit	Minneapolis and St. Paul	New York
		Representative total cost	Representative total cost	Representative total cost	Representative total cost	Representative total cost
		United States dollars				
Apartment[a]						
5-storey, low rent, brick and wood...	365,000	433,985	432,890	443,840	434,350	475,230
5-storey, luxury, brick and concrete..	365,000	636,925	651,890	662,840	629,990	721,240
Hotel						
modern, fireproof, brick and steel....	3,200,000	5,248,000	5,257,600	5,344,000	5,164,800	5,798,400
Factory building or warehouse						
brick and concrete construction.....	384,000	228,480	236,160	240,768	227,712	259,584
Office building						
fireproof, stone-faced, with elevators.	1,500,000	2,956,500	3,025,500	3,076,500	2,925,000	3,348,000
Store						
average, one-storey, face brick, veneer, construction.....	43,200	18,101	18,403	18,619	18,144	19,872

a Assumed to contain units of 1, 3 and 4 rooms with bath.

SOURCE: This table is derived by application of the building cost index numbers published by E. H. Boeckh and Associates in *Building Costs*, February, 1956. The method was to ascertain cubic foot costs at base period 1926-29 for some hypothetical buildings from Boeckh's *Manual of Appraisals* (1948 edition), and to apply the February, 1956 city indexes to the base period data in order to derive present cost per cubic foot. Multiplication by the number of cubic feet then gives total estimated cost for a representative building of the type designated.

Table 12

COMPARATIVE COSTS OF NEW HOUSES FOR SELECTED UNITED STATES AND CANADIAN CITIES, 1955

House Type	Sq. Ft. area	Halifax	Boston	Montreal	New York	Toronto	Detroit	Winnipeg	Minneapolis	Vancouver	Seattle
		(Can. $)	(U.S. $)	(Can. $)	(U.S. $)	(Can. $)	(U.S. $)	(Can. $)	(U.S. $)	(Can. $)	(U.S. $)
6-room frame house	1,650	13,950	15,703	13,950	17,109	15,150	15,703	14,600	15,786	15,250	13,885
5-room B/V house	1,165	10,950	14,260	10,750	15,536	11,800	14,260	10,950	14,335	12,200	12,609
6-room brick house	1,520	13,650	16,397	13,400	17,864	14,800	16,397	13,650	16,483	15,300	14,498
Frame ranch house	1,170	11,300	12,111	10,950	13,194	11,750	12,111	11,300	12,174	11,900	10,708
St'd. B/V ranch house	840	8,850	8,555	8,550	9,320	9,200	8,555	8,600	8,600	9,450	7,564
18-unit apartment (brick)	13,260	111,500	156,340	107,650	170,328	112,550	156,340	110,200	157,162	113,350	138,238
5-room California bungalow (frame)	992	9,900	8,977	9,600	9,780	10,250	8,977	9,900	9,024	10,400	7,938
30-unit apartment (brick)	21,372	176,650	333,800	170,700	363,666	178,350	333,800	174,600	335,556	179,600	295,149

SOURCE: Data for cities in the United States are from Roy Wenzlick and Company, *Wenzlick Construction Cost Manual*, 1955.
Data for Canadian cities courtesy of the Central Mortgage and Housing Corporation.

INDEX OF CONSTRUCTION COSTS[a], SELECTED CANADIAN CITIES, 1940 AND 1955

(1926-29 = 100)

City and Year	Residence		Apartments, Hotels and Office Buildings			Commercial and Factory Buildings				
	Frame	Brick	Brick wood	Brick concrete	Brick steel	Frame	Steel	Brick wood	Brick concrete	Brick steel
Montreal										
1940 average	99.4	101.5	102.7	90.9	96.3	97.4	96.2	105.5	90.8	97.0
1955 average	223.1	225.1	226.3	202.7	209.4	224.8	209.2	225.0	204.8	215.4
Percentage increase	124.5	121.8	120.4	123.0	117.4	130.8	117.5	113.3	125.6	122.1
Toronto										
1940 average	93.4	97.1	97.2	96.1	97.5	90.5	96.5	100.9	98.8	96.8
1955 average	235.9	238.8	239.1	222.3	224.0	236.1	221.2	240.4	225.5	229.0
Percentage increase	152.6	145.9	146.0	131.3	129.7	160.9	129.2	138.3	128.2	136.6
Winnipeg										
1940 average	98.1	98.9	99.4	99.0	102.0	95.7	117.0	100.0	101.5	104.6
1955 average	234.6	236.8	238.7	215.8	223.2	234.5	233.2	239.0	217.1	233.5
Percentage increase	139.1	139.4	140.1	118.0	118.0	145.0	99.3	139.0	113.9	123.2
Vancouver										
1940 average	82.0	89.6	94.4	100.3	101.0	79.6	115.0	100.5	103.6	100.5
1955 average	208.0	219.3	221.2	226.5	228.9	205.3	240.4	229.2	230.9	243.3
Percentage increase	153.7	144.8	134.3	125.8	126.6	157.9	109.0	128.1	122.9	142.1

a Labour, materials, profits and overhead.

SOURCE: E. H. Beockh and Associates, *Building Costs*, Vol. 13, No. 1, January, 1956.

Table 14

INDEX OF CONSTRUCTION COSTS[a], SELECTED UNITED STATES CITIES, 1940 AND 1955

(1926-29 = 100)

City and Year	Residences		Apartments, Hotels and Office Buildings			Commercial and Factory Buildings				
	Frame	Brick	Brick wood	Brick concrete	Brick steel	Frame	Steel	Brick wood	Brick concrete	Brick steel
Boston area										
1940 average	111.7	114.7	114.3	116.9	114.9	112.3	114.6	114.6	119.2	119.1
1955 average	264.3	271.9	271.9	271.1	267.8	268.8	263.1	269.9	279.6	280.7
Percentage increase	136.6	137.1	137.9	131.9	133.1	139.4	129.6	135.5	134.6	135.7
Detroit area										
1940 average	103.3	106.0	106.3	109.2	108.7	103.6	109.7	106.4	110.6	111.6
1955 average	272.2	279.2	277.4	281.5	272.7	280.6	265.3	273.4	292.7	287.6
Percentage increase	163.5	163.4	161.0	157.8	150.9	170.9	141.8	157.0	164.7	157.7
Minneapolis and St. Paul area										
1940 average	106.1	108.2	107.5	113.6	111.7	107.8	113.8	105.4	117.2	115.3
1955 average	264.9	272.4	271.4	266.8	262.4	269.0	251.4	272.4	276.6	271.7
Percentage increase	149.7	151.8	152.5	134.9	134.9	149.5	120.9	158.4	136.0	135.7
New York City area										
1940 average	124.6	125.7	125.1	132.0	127.4	128.0	124.3	122.2	134.9	131.2
1955 average	286.0	293.1	292.1	300.0	290.9	292.4	277.5	288.8	308.3	302.4
Percentage increase	129.5	133.2	133.5	127.3	128.3	128.4	123.3	136.3	128.5	130.5
Seattle area										
1940 average	99.0	106.2	105.5	119.1	115.1	97.2	112.8	109.4	124.9	117.7
1955 average	243.3	260.6	260.5	273.7	266.3	241.8	261.9	269.7	287.3	282.4
Percentage increase	145.8	145.4	146.9	129.8	131.4	148.8	132.2	146.5	130.0	140.0

a Labour, materials, profits and overhead.

SOURCE: E. H. Beockh and Associates, *Building Costs*, Vol. 13, No. 1, January, 1956.

PRODUCTIVITY OF WORKERS IN CONSTRUCTION OCCUPATIONS IN CANADA, BY PROVINCES, 1951

Workers and Output	Canada	Newfound-land	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskat-chewan	Alberta	British Columbia
Construction workers	299,611	7,105	1,659	14,012	8,790	91,172	106,534	15,074	8,135	18,814	28,316
Net value of construction (millions of dollars)	1,738	24	7	49	42	425	648	82	70	180	211
Output per man-year (in dollars)	5,801	3,378	4,219	3,497	4,778	4,662	6,083	5,440	8,605	9,567	7,452

SOURCE: Data on construction workers are from *Census of Canada, 1951*, Vol. IV, Table 4; data on net value of construction are from D.B.S., *Survey of Production, 1949-1953*, Table 7.

7

OUTLOOK AND CONCLUSIONS

Forecasts

Annual construction expenditures are expected to show a steady upward trend over the next 25 years, although minor fluctuations about the trend may be expected. No attempt is made here to forecast annual amounts for any of the intermediate years, but a forecast is suggested for 1980 as an indication of the extent of the growth which may be expected in construction activity. In that year, we anticipate that new construction may total $9.6 billion and repair expenditures $3.2 billion. Over the next 25 years, as a whole, we expect that constructon expenditures in Canada will total some $235 billion in 1955 dollars. Of this total, we expect about $55 billion will be for repair construction and $180 billion for new construction, with about $55 billion of the latter for new residential construction.

The main forecasts of construction expenditures presented here are not based on any elaborate techniques. They are built up from assumptions which appear reasonable in the light of present conditions and in the light of the material uncovered by this and other studies of the Commission. One method of forecasting construction expenditures is to relate them to the level of Gross National Product. The Commission's median estimate for G.N.P. suggests that by 1980 it will rise to some $76 billion in 1955 dollars, an increase of 184%. On the basis of G.N.P. estimates alone, we would therefore expect construction in 1980 to be nearly three times its 1955 level. However, other factors have to be considered, among them abnormalities in the present volume of construction in relation to the long-term trend. In Chapter 1 it was suggested that the recent level of construction expenditures in relation to G.N.P. has been well above the experience of the previous 25 years. This has been particularly true of housing. In our view and in the view of most observers, this proportion appears unlikely to be maintained over the next quarter century. This conclusion is based on the assumption that a portion of recent construction expenditures is attributable to the fact that relatively little construction was put in place in the depression and war years.

That construction expenditures will decline as a percentage of G.N.P. is also suggested by the method of approach which we favour. This alternative approach assumes a population of 26.7 million in 1980. It is also assumed that the participation ratio of the population in the labour force

and the extent to which the labour force is employed will not differ significantly from recent experiences. It is further assumed that the direction in which the population is employed will not change materially. Nevertheless, the relation between annual construction expenditures and population will not remain constant but is likely to rise, because of rising incomes, the growing complexity of buildings, and probable qualitative improvements. In 1955, expenditures on new construction in Canada amounted to $274 per person. The increase in new construction expenditures, in real terms and on a population basis, over the past 25 years from the period 1926 to 1930 to the period 1951 to 1955 was about 44%. A great part of this increase was probably due to the intervening depression and war which held back construction activity temporarily and brought about in the postwar years greater construction activity than otherwise would have resulted.

Over the next 25 years, ruling out such major factors as serious depressions and wars, it seems more reasonable to expect a lower rate of increase in construction expenditures per person than occurred in the last 25 years. An increase of about one-third in the 1955 figure for construction expenditures per person by 1980 would seem a reasonably optimistic expectation. This would put the 1980 figure for new construction expenditures, per person, at about $360 (1955 dollars). Applying this figure to a population forecast of 26.7 million yields our forecast for new construction expenditures in 1980 given above.

Turning to the various components of construction, we expect new housing expenditures to absorb a smaller share of Gross National Product in the future than they do today. Our 1980 forecast of $2.7 billion for spending on new residential housing involves an expansion of 80% from the 1955 level of $1.5 billion. This compares with a forecast rise of 71% in population to a total of 26.7 million people. In per capita terms, this forecast indicates a rise of 5% from the 1955 level of $96 a person spent on new housing.

Although on this basis our forecast for new housing expenditures may seem conservative, it is more optimistic than that made by the Central Mortgage and Housing Corporation. That forecast places total expenditures on new housing over the next 25 years at $35 billion and completions of new dwelling units over the period at 3,400,000. The latter figure is based upon anticipated net family formations and makes some allowance as well for normal depreciation of housing stock and for a reduction in the accumulated backlog of housing requirements. Annual figures are not given for either expenditures or completions but five-year totals for completions are forecast. Thus, over the five years from 1976 to 1980, total completions of 900,000 are forecast representing an annual average of 180,000. However, annual completions will have an upward trend so that completions in 1980 could be as high as 200,000.

The Central Mortgage and Housing Corporation forecast, however, allows as an average about $10,300 per completion over the next 25 years; the actual cost per new urban unit completed would be higher because the average is pulled down by conversions and by farm buildings, both of which are substantially lower in cost. On the basis of 1980 completions of 200,000 units, expenditures on new housing construction in 1980 would amount to $2.1 billion.

Our forecast of $2.7 billion for new housing in 1980, and some $55 billion over the period as a whole, allows for a much higher increase in the quality of housing, as well as a 10% higher volume of completions, on the basis of Commission material. Thus, we would estimate completions in the neighbourhood of 3,700,000 units in the period as a whole, which would yield an average of $14,865 per completion. In addition to these figures for new construction, we expect repair expenditures on housing to run at about 25% of new construction costs, slightly more than in the 1946 to 1955 period, an assumption which would yield expenditures of some $700 million in 1980. However, it should be noted that the Commission anticipates a rise of some 70% in real per capita incomes while we allow only for a 5% per capita rise in spending on new housing. It is generally agreed that the share of personal income devoted to housing will decline appreciably, but it may well be that we have underestimated the desire of Canadians for larger and better housing accommodation.

For building construction other than residential, we also anticipate some decline relative to G.N.P. although not as pronounced as in the case of housing. The Commission's preliminary estimate for expenditures on new structures for social capital purposes was $17-18 billion over the period as a whole. This total includes expenditures on schools, hospitals, churches and public buildings of all kinds, but despite these tremendous requirements this spending is expected to absorb a smaller share of incomes over the next quarter century than it now does. Commercial and industrial building is also expected to grow more slowly than G.N.P. and investment as a whole, with new investment being increasingly concentrated in machinery and equipment. Furthermore, the high volume of construction of office buildings, factories, stores and shopping centres in recent years has probably been partially attributable to the low rates in the preceding 15 to 20 years.

Accordingly, we estimate that expenditures on new industrial and commercial structures will exceed $35 billion over the next quarter century. By 1980 annual spending on new non-residential structures of all types might be of the order of $3 billion. As to repair expenditures, the factors making for greater relative importance of repair work, such as the increasing complexity of buildings, will be about offset by other factors such as the use of more durable or easily maintained materials; however, our forecast makes some allowance for a slight rise above recent levels.

It is suggested that the ratio of repair to new non-residential building construction as a whole will amount to 40%, or about $1.2 billion in 1980, and possibly $20 billion for the entire period.

Engineering construction, the other main group, may show a somewhat greater proportionate rise due to the increasing importance of road, hydro-electric and oil and gas pipeline construction. On balance, we expect engineering construction as a whole to total $93 billion in the period from 1955 to 1980, of which $70 billion might represent new expenditures. In 1980, expenditures may total some $5.2 billion, including $1.3 billion for repair expenditures.

These forecasts for construction activity and its main components are summarized in the table below :

Forecast for Construction Activity by Main Components, 1955-80 and 1980

(billions of 1955 dollars)

1980	New	Repair	Total
Structures	3.0	1.2	4.2
Engineering	3.9	1.3	5.2
Non-residential	6.9	2.5	9.4
Housing	2.7	0.7	3.4
Total	9.6	3.2	12.8
1955-80			
Structures	55	20	75
Engineering	70	23	93
Housing	55	12	67
Total	180	55	235

These estimates suggest an increase of 123% over the next 25 years for all new construction expenditures, compared to an estimated increase in G.N.P. of 184%. By comparison, the constant dollar value of new construction expenditures over the last 25 years increased 90%, compared to a rise of about 140% in real G.N.P. A considerably different picture is shown however, in a comparison of the prospective trends for the major groups. New residential construction expenditures increased 134% over this past quarter century, but in the next 25 years are expected to increase by only a further 80%. Non-residential construction, however, may in the next 25 years rise by 148% in contrast to the increase of 68% in the earlier period. The annual compound rate of increase foreseen for all new construction works out to 3¼%. In our opinion, such a rate is well within the capacity of the construction industry to fulfill. In the first place, it is much less than the growth rate which has prevailed in the

last decade, and which the construction industry has handled with considerable success. It is also less than the annual average rate of increase for new construction over the period 1900 to 1953 which has been estimated by Dr. O. J. Firestone at about 3½%.

To our knowledge, few other long-term forecasts of construction activity in Canada have been attempted recently, although those which have been made public differ in detail from the forecast presented here. Use of different assumptions, especially about population growth and Gross National Product, usually accounts for any differences. Thus, the assumption of a higher rate of growth in population and G.N.P. than we anticipate would produce an upward adjustment in our construction forecast.

The most detailed long-term construction forecast to appear recently was published in *The Financial Post,* February 18, 1956. The forecast was presented in chart form, but Mr. Clifford Fowke, the construction editor, kindly supplied us the figures on which the chart was based. This forecast grouped new and repair construction expenditures together but broke them down by major categories. This forecast, covering the years 1960, 1965, 1970 and 1980, is as follows :

Financial Post Forecast of Construction, Selected Years, 1960-80

(billions of 1955 dollars)

	1960	1965	1970	1980
Building	3.9	4.9	6.0	8.4
Residential	1.7	2.1	3.0	3.8
Industrial	0.9	1.0	1.1	1.7
Commercial	0.6	0.9	0.9	1.2
Other	0.7	0.9	1.0	1.7
Engineering	2.8	3.5	4.2	5.6
Roads, etc.	0.6	0.8	1.0	1.6
Power	0.4	0.7	1.0	1.2
Other	1.8	2.0	2.2	2.8
Total Construction	6.7	8.4	10.2	14.0

Many of these figures come from confidential studies made by some major companies in connection with their expansion plans. However, as the forecasting techniques and specific assumptions used were not available to us, we present the forecast with a minimum of comment. It allows for a slightly larger expansion in construction activity than our forecast and it provides estimates for intermediate years as well as a more detailed breakdown. It is useful as an indication of the views of others, closer to the construction industry than ourselves, on the outlook for construction activity.

Mention has already been made of the Central Mortgage and Housing Corporation forecast for residential construction. The other major organization concerned with construction activity — the Canadian Construction Association — presented two forecast figures in their brief to the Commission. They stated that "a continuation of the rate of progress in the construction industry during the next decade as has taken place in the past decade" would mean a "volume of construction in 1965 of over $10 billion expressed in current prices". For 1980 the Association forecast construction expenditures of $15 billion based on a Gross National Product of $75 billion, on the assumption that construction expenditures would continue to be equal to the high rate of 20% of G.N.P. reached in 1955. This is a more optimistic assumption than ours. However, even our conservative forecast reveals that a period of further substantial expansion of construction activity lies ahead.

New Materials and Techniques

During the past decade, considerable advances have been made in the development of new construction materials, and many new products have been introduced in Canada. These new materials offer several advantages over those replaced; they are generally more completely fabricated and are lighter in weight. The notable advantage of the more completely fabricated materials is the extent to which reductions in labour and installation costs are made possible; examples have been given in earlier chapters. The basic motive for the introduction of these materials is to offset the high cost and relative inefficiency of on-site labour. This is not a reflection on the efficiency of the tradesmen or workers, but on the characteristics of on-site construction which is extremely difficult to mechanize.

There will undoubtedly be much wider application of many new materials already introduced. Many of these materials have only exploited a segment of their potential market, and manufacturers are expected to promote further uses aggressively. We may expect to see a steady flow of newer and better materials. These materials will probably offer a higher degree of fabrication, and while their purchase price may be more than that of the materials replaced, substantial economies will be obtained from lower installation costs. In effect, the pattern will be to replace on-site work, with its many inefficiencies, by the use of materials which can be manufactured by highly mechanized processes not subject to seasonal difficulties. Similar advantages may be expected from the use of lighter weight materials, particularly in easier handling and installation, thus again reducing the on-site labour content of the finished product and promoting reductions in the weight of supporting construction materials.

The initiative of building supply firms and manufacturers can be counted upon to keep contractors informed of new materials as they are developed, and should be sufficient to insure the growing use of new materials

in finished structures and works. The natural interest of the contractor and the buyer in keeping costs down should also make for the best use of existing materials and the early acceptance of new products.

These, then, are the directions anticipated in the development of new materials. New techniques, made necessary by the more complete fabrication of materials and by the use of lighter components, will naturally have to keep pace. Competition will tend to encourage the spread of these new developments but we expect that this will apply more to the industrial and commercial field than to residential building. Generally speaking, the future trend in the introduction of new techniques is expected to be toward the further evolution of construction operations from a craft activity, involving cut and fit methods, into an operation which installs relatively complete components of the structure. Beyond this particular generalization it is very difficult to foresee what specific developments will be forthcoming, but changes are likely to come at a greater rate than in the past.

Mechanization

Further mechanization will undoubtedly be motivated by the same reasons that apply in other industries, namely the desire to economize in the use of labour and to reduce costs. For the most part, the construction industry is under a substantial handicap in connection with mechanization, since tools must be easily movable from site to site and to some degree within the site itself. Further, since the contractor's work is not standardized and each product is somewhat different in dimension from other products he has made, or will make, there is a limit imposed upon the degree of mechanization. The machinery used does not as a rule perform an operation repetitiously since dimensions are not standard and therefore there is not the continuity attained in other industries. Also, with fluctuations in total and seasonal demand, as well as shifts of demand from one area to another and from one type of product to another, management is understandably cautious about making large investments in machinery and equipment. The small size of firms noted above is also a limiting factor in this connection.

The present trend toward greater use of manual aids will probably continue. These supplement labour but do not replace it. Such items as paint sprayers, portable power saws and drills and a radial saw centrally located at the site are examples of such manual aids. With greater use of the new technique of prefabrication, and with prefabrication itself achieving a greater degree of manufacture, mechanization in the industry, but off the site, will naturally grow apace. Prefabrication with its more standardized output and controlled manufacturing conditions on a fixed site is naturally highly adaptable to mechanization. Together with some increase in the use of modular materials, these trends will bring about a gradual change in the nature of the industry and make it more susceptible to mechanization and further technical improvement.

Road building, pipeline construction, and indeed earth moving generally, have already become much more mechanized than the rest of the industry because of the continuity of their operations. Future developments in this sector will doubtless be an extension of developments taking place at the present time. Machinery is being built with greater capacity and better fuel economy and is being mounted on rubber rather than steel tracks to make it faster and more flexible. All these trends will involve still greater displacement of labour.

Management and Capital

The outlook for the construction industry is, of course, closely linked to the competence of management and supervisory staff. New products and techniques will probably tend to increase somewhat the size of firms in the industry. However, the larger the firm the greater becomes the problem of managerial ability. There is considerable evidence that the larger contracting firms are already having difficulty finding executives capable of supervising large-scale projects. As one large contractor said, projects of $2 million to $3 million used to be considered large and were not numerous in Canada, but now jobs of that size are commonplace and contracts of $8 million to $10 million are not unusual. Because executives to handle projects of this size are difficult to find, job superintendents and project managers have to be promoted to the executive level, often without adequate qualifications and experience. Alternatively, suitable executives must be brought in from the United States or other countries.

Managerial ability, however, is important for efficient operation of all construction firms, large or small. We found a great disparity among operators in ability and efficiency, as is perhaps to be expected in an industry characterized by large numbers of heterogeneous units and new firms. Every possible effort should be made by the industry to select and train junior executives in order to ensure an adequate supply of top level management.

An area which looks most promising for further improvement is that of supervision. The degree of organization on the site and the work of supervisors are, of course, very important influences on the efficiency of construction work. A number of means of improving the quality of supervision are already open to Canadian contractors; in recent years the University of Toronto and the University of Manitoba have given construction management courses and the Division of Building Research of the National Research Council has sponsored several two-day courses for builders. The British Columbia Heavy Construction Association runs courses for superintendents, and Canadian builders may send their technical staffs to the University of Illinois for a one-week demonstration course. Moreover, there are a number of construction courses leading to a degree at American universities.

Related to the question of management and efficiency is the matter of adequate financial capital. Too many contractors start operations with insufficient funds or are undercapitalized for the volume of work they take on, with the result that they overextend themselves. They frequently have been able to carry on by the use of bank credit and sales financing, but these provide at best a temporary solution. The basic problem of undercapitalization remains, and ideally should be solved by the infusion of additional equity. The main source of such additional equity funds for most firms, owing to their small size, must be retained earnings. It is doubtful whether construction firms as a group have been reinvesting a sufficient proportion of their profits over the past 10 years, and it seems likely that a greater proportion of earnings will have to be retained in the future if a high rate of bankruptcies is to be avoided.

The importance of competent management and adequate capital cannot be underestimated. As we have pointed out in Chapter 2, the high incidence of bankruptcies in the construction industry has been due in large part to inadequacies in one or both of these important entrepreneurial functions.

Research

Research connected with the construction industry falls into two main classifications: that undertaken by private industry and that undertaken by public authorities. Construction research by private industry will probably continue to be carried out primarily by manufacturers of materials and, to the extent that research is necessary to the development of new machines, by machinery manufacturers as well. A relatively increasing proportion of revenues is being spent at present by private industry on research and this higher level of research expenditures will no doubt continue. Two main causes are immediately apparent: the realization that in other industries research has been demonstrated to be a profitable venture, and a level of corporate taxation which reduces the net cost of research expenditures.

However, there is considerable scope for more technological research in construction, and particularly for the communication of existing and new technological knowledge to the industry generally. In the latter function, the various construction associations can play a crucial role by bringing new and existing methods and materials to the attention of their members. The industry itself, being largely composed of small and scattered units, is not in the best position to undertake responsibility for the control, direction and financing of all construction research. Nevertheless, more might be done in the way of joint research and in the financing of special research programmes to be carried out by governments, universities and research associations.

Construction research by public authorities does not, of course, receive impetus from competition for markets. We may assume that the prime motivation is the desire to provide for the country and its inhabitants the most economical construction that is consistent with high standards of health and safety. The Division of Building Research of the National Research Council now possesses physical facilities to carry out research on a number of fronts. Practical problems in the field, as discovered by Central Mortgage and Housing Corporation for whom the Division acts as a research wing, will likely continue to occupy the Division to a considerable extent. The Division has noted that it is receiving more technical enquiries from the construction industry, and widening recognition of its activities doubtless will lead to a greater desire on the part of private industry to use its facilities in future. Government spending on research by both the National Research Council and the various agencies responsible for public construction work will continue to play an important part in the development of improved construction materials and techniques.

It is, of course, difficult to imagine what specific future developments will materialize. However, since there has been increasing activity in research by both public and private agencies, and since awareness of the benefits of research has become greater, developments in the future will probably come more quickly than in the past. The prime aim of such research will, of course, be to induce greater productivity and efficiency in an industry which has at times lagged behind others in these respects.

Labour Supplies and Skills

It need hardly be added that future trends in the supply of labour and labour skills will be an important factor bearing on the industry's progress and efficiency. In the past ten years, the problem of a deficiency in the number of trained workers has been mitigated to some extent through immigration, apprentice training and experience acquired on the job by previously unskilled labour. While these methods produced a fair supply of skilled tradesmen, a considerable amount of tradesmen's work had still to be undertaken by semi-skilled labour. Moreover, the prospects for maintaining an adequate supply of skilled construction labour in the future is not entirely satisfactory; and if the supply of tradesmen provided by immigration should dry up, the industry will be hard put to find enough skilled tradesmen to meet its requirements. Finding a solution for shortages of skilled labour is one of the more pressing matters facing the construction industry today.

Although these shortages of skilled labour will create problems for the industry in the short run, they will intensify attempts to mechanize skilled manual operations and to replace manpower by efficient machinery and by new types of building products which can be handled by fewer or less-skilled workers. The partial displacement of the masonry and brick-

laying trades by the use of "curtain-walls" is an example of a trend of this kind. A decline in the requirements for workers in some of the traditional crafts will be accompanied by a lessening need for unskilled labour of the "pick and shovel" category, with both replaced by skilled or semi-skilled workers capable of handling new machinery, materials and techniques. An example of this is to be found in road building and earth moving operations, where economies of unskilled rather than skilled labour are being attained by the use of mechanical equipment requiring operators with new skills.

With respect to output per man-hour in the future, there seems to be rather general agreement that in the construction industry productivity gains will be almost impossible to achieve by the use of traditional methods. There is a limit to the amount of work that a skilled tradesman can accomplish with existing equipment and materials. In connection with this, the difficulty of instituting incentive systems must be mentioned. If an incentive wage system is to be effective the units of output must be very accurately measured and defined, and in the construction industry only a few operations lend themselves to such treatment. On the other hand, supervision is relatively easy because workers are within a small area, and quality control is essential. Despite these difficulties, some incentive systems are in use and, of course, the whole process of sub-contracting mentioned earlier might be regarded as a form of incentive system.

In view of the difficulties hindering any improvement in the productivity of workers using existing methods, it seems clear that gains in output per man-hour will depend primarily on the adoption of new materials and processes. In an industry composed of many units operating mainly on a local basis and with relatively little capital, these new developments are bound to spread comparatively slowly, even though facilities do exist to encourage their use. Certainly, if all the new developments now known were universally applied there would be a great increase in the productivity of the industry.

Looking ahead, we believe the nature of the industry will prevent any dramatic increase in productivity, and construction, particularly house building, will lag behind manufacturing as a whole in its rate of productivity increases. Nevertheless, we have outlined many reasons for believing that the industry will become increasingly dynamic and progressive. It seems to us, therefore, that an increase of approximately 2% per annum in construction productivity is probably the best guess that can be made for the quarter century between now and 1980. This, as noted earlier, is well above the long-term average of the past, although below the higher rates achieved in the special circumstances of the last few years. This estimate does not include those substantial productivity improvements which we expect to be realized off the site through the use of new materials.

A 17% fall in hours worked has been forecast by the Commission for the business sector of the economy, and we assume this will also apply to the construction industry. After allowing for this as well as for some slight increase in the proportion of the construction dollar absorbed by materials and after taking into account our estimate of the future rise in construction activity, a rate of productivity increase of 2% per annum on the site would yield an estimate for total employment in the construction industry of between 600 thousand and 625 thousand in 1980, as compared to 367,000 in 1955. For all types of construction activity employment might be of the order of 900,000 in 1980 compared to 550,000 in 1955.

Special Aspects

Cyclical fluctuations in construction activity have in the past severely affected the industry, and indeed before 1939 this was the cause of much of its difficulties. Although the years of full activity since 1940 have pushed the cyclical problem into the background, our forecast assumptions do not rule out the possibility of minor cyclical fluctuations in the level of activity over the next 25 years. In fact, it seems to us quite likely that such fluctuations will occur. While we do not think that they will be serious, it is possible that even relatively minor variations in the volume of work performed could have some adverse consequences on the efficient operation of the industry. However, experienced firms have on the whole been able to withstand rather severe fluctuations in the past, and we do not expect future changes in the level of activity to affect these firms very seriously.

In Canada, roughly two-thirds of construction is of a private nature, with comparatively little construction (10% in the period 1951-55) initiated by the federal government. In view of the relatively small proportion of total construction performed by the federal authorities, a direct counter-cyclical construction policy would require both a proportionately large increase in federal government construction expenditures and a large shelf of projects to be drawn from when economic activity threatened to fall off. Such extreme flexibility in Canada's federal public works programme is probably not feasible under present conditions of rapidly changing needs. Projects placed on the shelf become obsolete too quickly and while there is some scope for slowing down projects already underway, it probably cannot be carried very far as the 1956 experience shows. Present thinking on federal public works is to review the construction programme each year and to assign priorities in the light of current needs and the state of the economy.

Ruling out a direct counter-cyclical construction programme by the federal government, however, does not mean that government policies can have little effect on the level of construction activity. Monetary policy is effective in restraining and stretching out construction booms and in

stimulating construction in less buoyant times. By varying the amount of credit available and rates of interest, monetary policy can have a definite impact on construction, particularly on housing and municipal and provincial construction expenditures. This was shown in the slight recession of 1954 when easy monetary conditions enabled full advantage to be taken of changes in the National Housing Act; conversely, the restraint of credit in 1956 resulted in some slowing down in the rate of growth of construction activity. Admittedly monetary restraint is more effective than monetary stimulation, but the more upward movements can be dampened, the greater is the likelihood that downward movements will be less sharp. We therefore feel that it is in the interest of the industry, and of the public serviced by the industry, to submit to the discipline imposed by monetary policy rather than to attempt to insulate construction activity from that policy.

Government control of fluctuations has also been strengthened by the greater use and understanding of budgetary and fiscal policy. Changes in taxation, in government expenditures of all kinds, and in depreciation allowances, can all affect the level of spending in the economy. The volume of construction activity has also been stabilized by such legislation as the National Housing Act and by the tax-rental agreements with the provinces. In short, we believe that government measures can be used to prevent major fluctuations in economic activity such as occurred in the period prior to 1939, and, in this way, to reduce greatly the frequency and amplitude of cyclical fluctuations in the construction industry.

Another and related problem which has been receiving its full share of attention lately is that of seasonal fluctuations. It should be noted, of course, that such fluctuations are related to the general level of economic activity, being less severe in times of high employment, and the buoyant conditions of recent years have helped reduce the magnitude of this problem. With the share of the federal government in total construction activity relatively small, any direct action it takes to encourage winter building can have only a limited impact on the total flow of construction work, although it is extremely useful as an example to the industry of what can be done.

The seasonal problem can also be alleviated to a considerable extent by research, education, example, and moral suasion. In the last few years much has been done along these lines by various government departments and agencies and by groups and individuals in the construction industry itself. There is evidence that these programmes are having an effect and that seasonal fluctuations in the volume of Canadian construction work are becoming less severe. In this connection we have no other conclusion to offer than the obvious one that the current attack on the problem be continued without any loss of emphasis, regardless of the current level of activity in the industry.

The question of the quality of the product produced by the Ca-
 nadian construction industry is difficult to assess and we have made no

attempt to evaluate this rather nebulous subject. Complaints about quality in the last few years have been most often associated with residential construction. Questions of quality, of course, cannot be considered apart from price factors, but it is perhaps only natural to expect that the emphasis on quantity in the last ten years of house building should have caused quality to suffer to some extent. There is little doubt that more emphasis will be put on quality in the future, but we feel that this is a shift best brought about by greater discrimination on the part of buyers. Indeed, with the edge now off the sellers' market for new homes, buyers can be expected to become more discriminating. We uncovered no general or widespread complaints about the quality of non-residential construction put in place since 1945. But there are so many dimensions to quality, among them the type of materials used, that we could make no assessment in this sector.

Licensing of all contractors and builders is sometimes advocated as a means of raising the quality and efficiency of the industry. The advantages claimed for such a scheme are: that it could be used to screen out potentially undesirable operators; that it could be used to grade operators for particular sizes of jobs and so prevent indiscriminate bidding or overbidding; and that it could be used to restrict the number of operators in the industry. The industry itself is not at all agreed that licensing would be either a good idea or a feasible one. The main objection to any licensing scheme centres on the difficulty of assessing the competence of would-be contractors and on the difficulty of administering any policing action that would be necessary. It is further argued that the public is sufficiently protected against grossly inefficient, negligent or fraudulent operators by existing laws. We ourselves can see little need for general licensing. It would seem best to have as much freedom of entry as possible for new firms and to allow the forces of competition to eliminate the inefficient. There is always the danger that any licensing scheme would be applied too restrictively and would interfere unduly with freedom of entry for qualified and efficient operators.

Among other problems facing the industry is a matter of special concern for the residential building sector, namely, the increasing scarcity of serviced land. This is mainly a municipal financing problem and in many cases is being solved by the contractor assuming the responsibility for providing serviced land, by putting in the services himself and adding the cost to the selling price of the houses erected on the land. This development is not always welcomed by contractors but it does have the advantage of amortizing the capital cost of services over a long period. In view of the long life of service assets this practice may be more appropriate than the shorter repayment policies of most municipalities. It also places less of a strain on under-staffed municipal engineering departments.

Another matter affecting residential construction, about which some complaint is heard, is the action of speculators in withholding from the market land suitable for use as building lots. This complaint is of course related to the general shortage of land available for development, but the prevalence of land speculation is impossible to measure. However, if it threatens to create any undue difficulties for builders, it will become a problem on which local taxing authorities will be required to act. But we do not feel that we have sufficient documentation to draw any conclusions on the question.

Finally, a problem affecting contractors bidding on public works, projects seems to arise because of over-rigid tendering requirements on government contracts and delays by government authorities in making progress payments, returning deposits and releasing holdbacks. Complaints about this were general enough to lead us to believe that government authorities might re-examine their regulations and practices to see whether their timing and flexibility could not be improved without sacrificing careful management of public funds.

In this chapter we have touched on the prospects and some of the major problems facing the construction industry in Canada today. To these problems there are no quick or final solutions but, on the whole, positive measures are being taken to reduce their seriousness. In any event, we are confident that the Canadian construction industry will continue to grow. We expect in fact that its physical output in 1980 may be some two and a half times its 1955 level. Employment will rise more slowly, or by about two-thirds, owing to the encouraging prospects for productivity which can be looked for as construction firms in this country become increasingly mechanized, better organized and more efficient.

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APPENDICES

Appendix A

GENERAL QUESTIONNAIRE FOR CONSTRUCTION FIRMS

The following questionnaire was completed by 64 construction contractors (nearly all of whom were general contractors) located in various parts of the country. The questionnaire was distributed to these contractors by bank officers on the scene and wherever possible replies were obtained in a personal interview, after the respondent had had time to study the questionnaire. Our interviewers were instructed to get as detailed answers as possible so that the replies were more in qualitative than quantitative terms.

Questions put to Selected Firms in the Canadian Construction Industry

I — Introductory Questions
(for purposes of classifying replies)

1. What are the main types of construction work you have done in the last few years?
2. How long have you been in business?
3. How did your business expand to its present size?
4. Have you been able to develop your business as fast as you wanted to? If not, why?
5. Is most of your work done on a contract basis? Do you ever initiate any work yourself? If so, what types of work?

II — Questions Relating to Operating Policy

1. How do you usually hear about the jobs you consider bidding for? What are your major sources of information?
2. How far afield do you go in taking on work? What determines the area you restrict your bidding or building to?
3. How do you decide whether to bid for, or initiate, a job? What factors do you take into account in making your decision?
4. What is the smallest job you will bid for? What discourages you from taking a job smaller than this?
5. What is the maximum size job you will take on? What determines the maximum?
6. Is there any limit to the number of jobs or the amount of work you can handle?

7. Do you always have enough work for the machinery and men you have on hand? Are there times when you feel you could handle more work without much difficulty?
8. Do you need a certain amount of work to break even — that is, to meet your standing expenses? If so, what determines the amount of work you need?
9. Are contracts usually awarded to you because your bid is the lowest? Are they ever awarded to you on any other basis? If so, why?
10. On fixed-sum contracts are you usually able to make an accurate estimate on the cost of the job? What is the usual margin of error?
11. Is the information you have to bid on usually sufficient to enable you to make a reasonable estimate of costs?
12. What determines how soon you start work on a job after you have been awarded a contract?
13. What are the most important trades you have to sub-contract?
14. Do you ever have trouble finding sub-contractors for certain types of work or for work in certain areas?
15. Is the amount of work you sub-contract fairly rigid for various types of jobs, or can you vary the amount of work you do and the amount you sub-contract? Please elaborate.
16. Is the nature of your competition changing? If so, in what way and in what directions?
17. Do you carry any inventories, other than equipment? How far in advance do you purchase materials for a job?

III — Questions Relating to Costs and Labour

1. What factors most affect your costs?
2. If you initiate any projects are land costs a significant item?
3. What types of construction work do you find most profitable? Least profitable?
4. What margin of profit do you try to make?
5. What percentage do you need to cover your overhead?
6. Can you do any work in the winter time? If so, what kind?
7. What new arrangements, if any, would enable you to do more winter work?
8. If you can do winter work is it more costly? If so, how much more costly?
9. What proportion of your labour is unionized? What unions are most of them members of?

10. What conditions, other than wages and hours of work, do your labour contracts cover? How long do your contracts run? Do you have one or several labour contracts?
11. What proportion of your labour is skilled? What labour skills are the most essential to you? Are they hard to get?
12. Do your labour needs vary seasonally for all types of workers or just for some? What type of labour, if any, do you employ all year? What types are most subject to your seasonal demands?
13. Has the efficiency or productivity of your labour shown any changes over the postwar period?
14. Do you have any other labour problems?

IV — Questions Relating to Technical Aspects

1. Are your operations becoming more mechanized?
2. What determines whether you rent or buy a piece of equipment?
3. Have you introduced any new methods, techniques, or machinery into your operations in the last ten years?
4. If you have introduced new methods and techniques where or how did you find out about them?
5. What new building materials have you used in the last ten years?
6. What, from your point of view, have been the most outstanding developments in construction methods, techniques, materials, and machinery in the last ten years?
7. Is all your work done on the site or can you do any off-site work? Is there any trend to more off-site work?
8. What do you consider to be the "normal" construction time between commencement and completion of different types and sizes of projects?
9. Have there been any changes in construction times for similar types and sizes of jobs over the last ten years?
10. What are the most common delays which can occur on a construction job? What can be done to keep building times to a minimum?
11. Do you have any technical problems at present whose solution would improve your operations?
12. Do you foresee any new developments in techniques, equipment, or materials which might be available to your firm sometime in the next 10 or 20 years?

V — Questions Relating to Financing

1. Is there any connection between the amount of permanent capital you need and the amount of work you do? That is, do you need more capital as the volume of your business expands?

2. What are the most important sources of short-term finances to you?
3. What are your terms of payment with your suppliers? How long after delivery do you pay them?
4. What arrangements do you make with your sub-contractors for payment, etc.?
5. How are you paid for the work you do?
6. How long is it, usually, after you start work before you receive any payments?
7. What financing problems do you encounter most often?
8. Have you any comments to make on present financing techniques? Any suggestions for improving them?

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[1] This is one of a series of three studies on Canadian international economic relations prepared under the direction of S. S. Reisman.

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